REGULATIONS FOR THE LIBRARY

OF THE

Massachusetts Horticultural Society,

ADOPTED 1861.

ARTICLE I.

All Books, Manuscripts, Drawings, Engravings, Paintings, Models, Furniture, and other articles appertaining to the Library, shall be confined to the special care of the Committee on the Library.

ARTICLE II.

When any books or publications are added to the Library, a list thereof shall be posted up in the Library Room, and all such additions shall be withheld from circulation for the term of one month.

ARTICLE III.

The following Books of Record shall be kept:—

No. 1. A Catalogue of the Books.

No. 2. A Catalogue of the Manuscripts, Drawings, Engravings, Paintings, Models, and all other articles.

No. 3. A list of all Donations, Bequests, Books, or other articles presented to the Society, with the date thereof, and the name and residence of the donor.

ARTICLE IV.

Rare and costly books shall not be taken from the Library Room. A list of such works as are to be withheld from circulation shall be made out from time to time by the Library Committee, and placed in the hands of the Librarian.

ARTICLE V.

No more than two volumes shall be taken out by any member at one time, or retained longer than three weeks; and for each volume retained beyond that time a fine of ten cents per week shall be paid by the person so retaining it. And a fraction of a week shall be reckoned as a whole week in computing fines.

ARTICLE VI.

Every Book shall be returned in good order (regard being had to the necessary wear thereof with proper usage), and if any Book shall be lost or injured, the person to whom it stands charged shall, at the election of the Committee on the Library, replace it by a new volume or set, or pay for it at its value to the Society.

ARTICLE VII.

All Books shall be returned to the Library for examination on or before the first Saturday in July, annually, and remain until after the third Saturday of said month, and every person neglecting to return any Book or Books charged to him as herein required, shall pay a fine of twenty cents per week, for every volume so retained. And if at the re-opening of the Library, any Book shall still be unreturned, the person by whom it is retained shall pay for the said Book or set, as provided in Article VI, together with any fines which may have accumulated thereon; and a notice to this effect shall be forthwith mailed to him by the Librarian.

ARTICLE VIII.

No member shall loan a book to any other person, under the penalty of a fine of $1.00.

ARTICLE IX.

When a written request shall be left at the Library for a particular Book then out, it shall be retained for the person requiring it, for one week after it shall have been returned.

ARTICLE X.

Every book shall be numbered in the order in which it is arranged in the Books of Record, and also have a copy of the foregoing regulations affixed to it.

PRESENTED

TO THE

Massachusetts Horticultural Society,

BY

Benjamin K. Bliss,

November 3, 1898.

THE HISTORY OF THE Propagation & Improvement OF VEGETABLES By the concurrence of *ART* and *NATURE*:

Shewing the several ways for the Propagation of Plants usually cultivated in *England*, as they are increased by Seed, Off-sets, Suckers, Truncheons, Cuttings, Slips, Laying, Circumposition; the several ways of Graftings and Inoculations; as likewise the methods for Improvement and best culture of Field, Orchard, and Garden Plants, the means used for remedy of Annoyances incident to them; with the effect of Nature, and her manner of Working upon the several Endeavors and Operations of the Artist.

Written according to OBSERVATIONS made from Experience and Practice.

The Second Edition much Enlarged.

By *Robert Sharrock*, Fellow of *New-College*.

OXFORD: Printed by *W. Hall*, for *Ric. Davis*, *Anno Dom.* 1672.

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Imprimatur,

P. MEWS

Vice-Cancellarius.

OXON:
May 22.
1671.

To the Honorable *Robert Boyle* Esq;

The most worthy Pattern of true Honor,

And Learned Promoter of true Science.

SIR,

IT is a saying in the Civil Law, *That a thing which is any Mans own, cannot be made more his by any new Act or Deed:* The consequence of which, is, that the Dedication of this Peice to you will be meerly Nugatory, since by all right it is already yours. For it is not long since I imagined no more being either Author, or Compiler of any matter on this Subject, then of doing any other thing which I have neither fancy nor fitness to. But you were pleased to judge me able, and (which obliged me to this task) to propose it unto me as your desire that I should make an Essay of that ability, in writing somewhat even on this subject, that might be of Philosophical and common use. To have questioned your judgment herein, might have stained me with too much arrogance, and to have been careless of your pleasure, with unworthiness and want of

good Manners. Remembring therefore those respects I owe to Honor, Learning, and such persons as study its advancement and promotion, I could not deny this poor endeavour, the product of which arising originally from your own act, I thought fit should be delivered over to your pleasure, since to you, as its primary cause (which is its prime commendation) it ought to belong.

And Sir, If it may not be troublesome unto you to receive some brief account of this action, and the Fortunes which happened to me in pursuance of your satisfaction therein, you will give me leave to acquaint you, that it having been your Honours express desire, that this Piece might extend as far, and be as comprehensive and full, as my present Experience, Knowledge, and Recollection of the matter of Vegetable Propagation should permit: I gave my self the trouble to run over with my eye, all Books I could procure of these subjects, not intending to trust any, but thereby to be put in mind of the particulars, concerning which, I had no reason to have a Register ready in my head. Here first my for-

tune

tune was to find a multitude of monstrous untruths, and prodigies of lies, in both Latine and English old and new Writers, worse in their kind then the stories in *Sir John Mandevel's* Travels, or in the History of Fryer *Bacon* and his Man *Miles*; or else what may be more ridiculously removed not only from truth, but from any semblance thereof. And which moved me most at this very season, when we esteemed the World to be now awaked, I found in the Shops Authors newly set forth (I hope against their own wills) who seriously professed to have *made a select choice of Experiments* of this nature, *and to report nothing, but what from observation and experience they have certainly found true*, yet deserving not to have the credit of *Wecker* and *Porta*. Professions in such Papers, which seem to me at no time proper, but when the persons credits, together with their Books, are joyntly to be set to sale. You easily believe that I am not free to follow these Examples, for then, first, I must abuse your Noble Name, by inscribing it to a most unworthy Discourse, and then (which is too common a fault) traduce as many Readers, as ignorance and simpleness of nature hath made credulous. But

But as to thoſe Authors, in whoſe relations I found any thing of truth, I have done them this right, That where ever I could relate an Operation or Experiment in their words, with truth and fitneſs, I ſpared to coyn new (deſiring to ſupplant no Author in his credit, nor to purloyn his reputation) though I had learned the truth of the ſame thing from the teſtimony of my eyes: Having indeed ſome quarrel at the faſhion of ordinary Writers, who ſtudy in nothing to benefit Learning, but by giving new words to old matter.

I have left out none of the Heads propoſed in the Catalogue, which I preſented you with, a year ſince, except the laſt, which you deſired might ſhew the methods and ways of keeping uſeful Vegetables without putrefaction, and the preparing them with their ſeveral parts and products for humane uſe. This at preſent I thought neceſſary to forbear, for I found the matter too much for one Chapter, and my leiſure too little to make a Book thereon: nor durſt I eſteem my Obſervation ſuch, as might enable me to write an adequate Treatiſe on that Subject, which reaches in compaſs the largeſt,

and

and as I firmly believe (however the Animal and Mineral Kingdom abound with great and potent Medicines) not the worſt part of the *Pharmacopœa*, and many particulars beyond; but rather think fit to employ my ſelf ſome more years in the Experience and Practiſe of Preparations, and take the pains of collecting and trying ſuch intelligible and probable proceſſes as ſhall come to my hand, either reported heretofore, or uſed now, eſpecially in our Nation, for fitting matters to Alimental, Medical, and Mechanical uſe, before I ſhall imagine to have the leaſt hand in that Hiſtory, which may as well be learn'd by ſuch as are concern'd to know it, from Modern Diſpenſatories, and other novel Writers. But the perfection of that Hiſtory, with correction of proceſſes capable of amendment, is, in my eſtimation, a deſign and work worthy of the Care, Patronage, and Governance, and fit to be carryed on by the intereſt, if too tedious for the Pen and Pains of your Honor.

As to the form and compoſure of matter under thoſe Heads, I muſt make it a particular buſineſs to beg your Pardon; for I find it even in my own judgment exceeding

rude, and it could be no otherwise, when the Revise of the Press, was, for a great part, the first review made of my own Writing; and indeed, the whole piece in every part seems destitute of beauty, and without any thing of great worth, value, or nobleness. For I find, that the operations themselves, and other matters that do belong to the subject in hand, and so capable to come under this History, are for the most part common, and devoid of curiosity: Nor durst I embellish their plainness with Stories taken from our Learned and Profound Writers of Natural Magick, because I intended, as no very imperfect, so likewise a true Inventary of what the power of man, at this present time, on this subject, is, with the Co-operation of Nature, able to produce: For these reasons, and perchance because of another peice then under my hand, to which I had more propense affections, I was exercised in this writing, not without some reluctancy and untowardness of mind; and it surely had proved to me a peice of meer drudgery, had not the hope of giving you satisfaction, and making this a testimony of my obeysance, and humble submission to

your

your Judgment and desires inspirited me, and let a lightsomness into my thoughts. What I have written, I shall not commend, by any Prefaces, to any Reader, though I shall give him here some things new, and of my proper Observation: I know that many, by their own Interest and (that great power) Temporal Profit, will be tempted to give it the reading. Neither shall I, in imitation of some Modern Alchymist, for ostentation, bid them goe, and by the improvement (which I hope may be some to most Readers) be charitable to the poor: Hoping, that for Gods sake, they will rather (as they are bound by Obligations infinitely more high) be thereto moved; nor need I excuse my self to them for any deficiency in this Writing, you having ingaged your self to be the proprieter thereof, and by your acceptance of this poor piece, greatly obliging,

SIR,

Your Honors unfeignedly Devoted in all humble and affectionate observance.

R. SHARROCK.

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THE

THE HISTORY OF Artificial Propagation of Plants.

CHAP. I.

THE PREFACE.

THE Illustrious and Renowned Lord *Bacon*, in his discourse concerning the advancement of Learning, reckons it among the Deficients of Natural History, *That the Co-operation of Man, with Nature in particulars, hath not been observed; and that in those Collections which are made of Agriculture, and other manual Arts, there is commonly a neglect and rejection of Experiments, familiar and vulgar, which yet to the interpretation of Nature,* (and which I shall add, general profit,) *do as much, if not more conduce, then Experiments of a higher quality.* The same noble Person, in his

partition of Philosophy, complains of the want of an Inventory of what in any subject, by Nature and Art is certainly, and may be undoubtedly wrought. I believe his Lordship hath had many of his mind in former, hath now, and is likely to have in future ages; For amongst those few Writings extant on these Subjects, some prove altogether useless, as being so full of their natural Magick and Romantick Stories, that we know no more what to credit in those Relations, in the Natural, then what in civil History we may believe of King *Arthur*, *Guy* of *Warwick* in ours; or of *Hector* and *Priam* in the *Trojan* Story: Others elevated in their Fancies, write in a Language of their own, addressing their Discourse to the Sons of Art, speaking rather to amuse, than instruct, and prove like blazing Stars, that distract many, and direct few.

Many of those who would write for Universal Instruction, either know the things that might make up the matter of their History, but want the skill to draw up such an Inventory, as my Lord *Verulam* requires, to common Tradesmen and Artisans; or else indeed are learned enough to draw up the writing, but want the knowledge of most of the particulars therein to be ingrost; which is commonly the case of such of us as have pretensions to Scholarship.

I being necessitated by my obligations and respect to a Person truly Noble, to give some account

account of the particular effects of *Man*, co-operating with nature, in the matter of our Englisſh Vegetables, as they are improved by Husbandmen and Gardiners, deſire to undertake no more, but to give a ſincere endeavour, That the way of the Artiſt be ſet down, and the effect of Nature thereon; in the firſt of which, I intend my directions ſo plain, as if appointed for the inſtruction of ſome Artiſts rude and untaught Apprentice: and in the ſecond, if not ſo homely, yet as eaſie and evident; being a little diſguſted with any thing intended for the uſe of Philoſophy, when overgarniſhed with Rhetorical Tropes, which like Flowers ſtuck in a Window for whatſoever intended, (either cheat or ornament) certainly create a darkneſs in the place. *Behemenical*, *Paracelſian*, and ſuch Phraſes as many Alchymiſts uſe, I muſt for the ſame reaſon avoid.

In the drawing up the Inventory, I will ſtudy that it may be true in all parts, and not to mingle according to the example of *Pliny*, *Wecker*, *Porta*, and many more, both Latine and Engliſh Writers, any falſe relation, without its diſtinguiſhing Character; and if it be not perfect, it ſhall be for want of skill, or preſent remembrance of particulars, and if it be accepted, *cum proteſtatione de addendo.*

Num. 1. *How many ways of Propagation there are; The division of them into their species.*

Of Natural Propagations, and seminal Principles latent from the Creation.

The wayes of Propagation, are either Natural or Artificial. We call those wayes Natural, in which there is most of Nature and little of Art, those artificial wherein the Artist is more assistant in applying agents and patients for the production of the desired effect. For even in the wayes of Propagation that are most artificial, there is more of Nature than Art. Industry and Art may bring Materials, and place them fitly for it, but Nature works them. And therefore, as one sayeth, it is the great Art of Man to find out the Arts of Nature. There are many Methods of Nature that are secret; Many of her secrets have been found out, and are followed by Artists to the Improvement of the Treasures and Powers of Man.

Of things propagated Naturally, *Virgil* speaks,

Sponte sua quæ se tollunt in luminis Auras,
Infœcunda quidem sed læta & fortia surgunt.
Those trees, which of themselves are fostered,
Unfruitful be, but strong, and fair they spread.

This is our unhappiness, that whereas before Mans transgression, the Earth spontaneously, and

and without humane Industry and Culture, brought forth all manner of useful Plants, according to the command of God, *Gen.* 1. 11. Now since the Curse, it bringeth forth of its own accord onely those that are less useful, and the rest, not without the Art, the sweat of Man: *Totus Mundus*, saith a Rabbi, *tantum propter hominem conditus est, postquam igitur homo peccavit diminuta fuit terræ perfectio.* We cannot but see the truth of Gods prediction; That the *Earth of its* own accord *should bring forth* Thorns and Thistles, *and that Man in the sweat of his face should eat his bread.* For we see that Plants of great use in Human life, are not brought to perfection without great Industry. There are indeed some that the Earth still brings forth spontaneously without seed, without off-sets or layers, or any other of those artificial wayes of propagation. But what are they but Thorns, Briars, Thistles, and other rude, imperfect, and almost useless Plants. Thistles, though they have a perfect seed, yet the Earth will bring them forth without it. The same thing cannot be said of Wheat, or other useful Plants. Ferne and Heath, Mushroom and Moss, and some other of like Natures arise also without seed, and so might Lilies and Roses still have done, had not the production of better Plants been made more difficult by that Curse of God which man drew upon the Earth. It is the Opinion of the best Philosophers and Divines,

Jewes, Heathens, and Christians, that in the Method of the Creation God first made a Chaos, in which were the principles and seeds of all beings, Plants as well as others. *Moses* telleth us, that God created every Plant of the field before it was in the Earth, and every herb before it grew, *Gen.* 2. 5. If you ask when that was, the Learned tell you, that it was in *Principio primæ diei*, when God is said to have created the Heaven and the Earth, that is the Mass of Heaven and Earth; Containing the substance of them, and of all creatures to live in them, mingled together in a confused Chaos: The Earth was not then perfectly fashioned as it is now. For it is said in the following words, That *the Earth was without form, and void*; and *Fagius* hath this critical Observation on the Text, that the Particle את in the phrase [את השמים ואת הארץ] detecteth that it was not the Earth in form, but the substance of the Earth that was then said to be created: and *Munster* out of the Rabbins telleth us, that it was *Moles Terræ & Aquæ*, that was then created, in which were the principles of all Heavenly and Earthly Bodies also. S. *Augustine* frequently hath expresst himself for the same construction, so *lib.* 1. *De Genesi ad literam, cap.* 4. he giveth us this paraphrase of the Text. *In principio Deus fecit cælum & terram. Hoc autem quod cælum & terra dictum est terra erat invisibilis & incomposita & tenebræ super abyssum: id est, quod cælum & terra appellatum est*

est, Materies erat confusa quædam, de qua Mundus (qui duabus maxime partibus cælo scil. & terrâ constat) digestis Elementis & acceptâ formâ fabricaretur. That is, whereas it is said, that in the beginning God made the Heaven and the Earth; It is to be noted, that that which is there call'd Heaven and Earth, was invisible, indistinguishable in its parts, incomposed, and darkness was upon the face of that Chaos: in short, that which was call'd Heaven and Earth, was the matter of which the whole world, whose chief parts are Heaven and Earth, were to be made, which same matter He therefore frequently calleth *Semen Cæli & terræ.* Vide lib. 1. *De Genesi contra Manichæos,* cap. 1. & cap. 6. & 7. *Informis illa Materia, quam de Nihilo fecit Deus appellata est primo Cœlum & Terra; & dictum est, In principio Deus fecit Cœlum & Terram, Non quia jam hoc erat, sed quia jam hoc esse poterat, Nam & Cœlum scribitur posteæ factum. Quemadmodum si semen Arboris considerantes dicamus ibi esse radices & Robur & Ramos & folia & fructus, non quia jam sunt sed quia inde futura sunt: sic dictum est in principio Deus fecit cœlum & terram quasi semen cæli & terræ cum confusa adhuc esset cæli & terræ Materia.* That matter without form which God made out of nothing [he means, as he declares in the 4th Chapter, the same which the Greeks call'd their Chaos] was called first the Heaven and the Earth. And it is said in the beginning, God made the Heaven and the Earth, not be-

cause it was such already, but because it might be so. For the Heaven is said to be made afterward, as if upon the consideration of the seed of a tree, we should say, that there is a root, and stock, and boughs, and leaves, and fruit, not that they are such already, but may become such, so is it said that in the beginning God made the Heaven and the Earth, that is as it were the seed of the Heaven and the Earth, when as yet the matter of them lay together mixt and confused.

And the Philosophers and Poets, either had the same doctrine by Tradition, or if they read the books of *Moses*, thus also they understood them. So *Linus*,

Ἦν τοτέ τοι χρόνος ἓν ᾧ ἅμα πάντ' ἐπεφύκει.

There was a time when all things lay together mixt. —— And *Euripides*.

Οὐρανός τι γαῖαν ὧν μορφὴ μία
Ἐπειδ' ἐχωρίσθησαν ἀπλάτου δίκα
Τίκτουσι πάντα· καξέδωκαν εἰς φάος
Ἄνδρα, Πετρεικὰ, θῆρας, ὅσ' Ἅλμη τρέφει
Γένος τῶν ὀπλῶν. Eurip. in Melanippe.

There was one face of Heaven and Earth, but when
These from their Chaos sever'd were,
Plants, Beasts, and Fouls, and Fish appear,
And last of all the Nobler off-spring, Men.

And *Apollonius* in Argonauticis.

Γαῖα καὶ οὐρανὸς ἠδὲ θάλασσα
Τὸ πρὶν ἔτ' ἀπλάτοισι μιῇ συναρηρότα μορφῇ
Νείκεος ἐξ ἀλαοῖο διέκριθεν ἄμμορις ἑκασταί.

The

The Earth, the Heaven, and the Sea,
First in one figure mixed lay,
Dark was the Chaos, blind the strife,
Which parted, all things came to life.

But none of them have more plainly or fully expreſt this then *Ovid* in his *Metamorphoſis.*

Ante mare & terras & quod tegit omnia, cælum,
Unus erat toto Naturæ Vultus in Orbe,
Quem dixere Chaos, rudis indigestaque moles,
Nec quicquam niſi pondus iners, congestaque eodem
Non bene junctarum diſcordia ſemina Rerum.

The ſea, the earth, all-covering Heaven unfram'd,
One face had nature, which they Chaos nam'd:
An undigeſted lump; a barren load,
Where jarring ſeeds of things ill-joyn'd aboad.

And *Valeſius* upon that Text of *Eccleſiaſticus*, *Deus qui ſemper eſt, fecit omnia ſimul. Verè*, ſaith he, *fecit omnia ſimul in illo mundi Initio, non tamen omnia eodem modo ſed alia quidem ipſa per ſe, alia in ſuis principiis.* Truly God did make all things in the beginning of the world, but he made not all things after the ſame manner, for ſome he made actually ſelf-exiſtent, other things he made alſo that were then latent in their ſeminal principles. The principles and ſeeds of all things therefore being in this Chaos, and theſe principles and ſeeds, in the ſtyle of *Moſes*, bearing often the names of the things themſelves, as is above diſcours'd; You ſee how that Text of *Geneſis* is true, where

where it is said, that God created every Plant of the field before it was in the Earth, and every herb before it grew. Namely the principles and seeds of them were created in the first Chaos. And to this first Creation of Plants before they grew, must we have recourse for the cause of all those spontaneous productions of Vegetables, such I mean as spring of their own accord without seed, or any other of the usual means of Propagation. And surely all other more useful Plants had either sprung up spontaneously, or at least had been propagated with less difficulty, the seeds would have sowed themselves, and the earth have open'd its bosome to receive them, had not Man merited by his transgression that decree of God, that the earth of its own accord bring chiefly thornes and thistles, and that in the sweat of his face he should eat his bread. And surely there was some Tradition even of this Curse also among the Heathen.

——Pater ipse colendi
Haud facilem esse viam voluit,----
Nor was Jove *pleas'd, tillage should easie be.*
Virg. Georg. 1.

And *Hesiod* telleth us, that in Agriculture the Gods have appointed work, not idleness for Man, and that he must beg his bread, or get it by his labour. Ἔργ. ἡμερ. Βιβλ. Β.

Seeing therefore we cannot hope to enjoy the full benefits of the Vegetable Kingdome, and yet to live in a perpetual Sabbath or cessation from

from labour, nor that it ſhould be with us as it was with our firſt Parents, when to ſpeak in the phraſe of the Poet,

Immunis, raſtroque intacta, nec ullis
Saucia vomeribus, per ſe dabat omnia Tellus.
The yet-free earth did of her own accord
(Untorn with Plows) all ſorts of corn afford.

We muſt conſider how to ſollicite Nature ſo, as to make it anſwer our expectations, and to advance the wayes of propagation by Art and Induſtry.

The end of the Artiſt is to find out the Arts and ways of Nature, and ſo to Propagate and Improve: To propagate, is to multiply the individuals of each kind: And to improve, is to bring them, being propagated, to a more then ordinary excellency and goodneſs. The ways of increaſing the particulars of each kind, are, 1. By Seed, 2. By off-ſet, taken from a Mother-Plant. 3. By laying the Branch of a growing Plant down into the Earth. 4. By bearing up a Soil to it. 5. By Stems ſet without roots. And laſtly, By the various ways of grafting and inſitions.

Concerning all theſe, as likewiſe the preſervation and melioration of things propagated, I ſhall endeavour to enumerate what Plants may be increaſed by each of theſe ways, and to ſhew how the operation in each may be performed, and what the product is that by nature thence ordinarily enſues: Definitions are

are hopeleſs in this matter, uſeleſs too, and it might be harmful: If I ſhould define Sowing, to be caſting of Seed into the Earth, in ſuch manner, and at ſuch time, when in the ſurface of the bed the earth would ſo ferment, as might be proper to the explication and further germination of the Seed and increaſe of the Plant, there might a world of controverſies ariſe about the particulars therein contained; and yet all that is there would be uſeleſs, till the particular Plants, and the manner of the operation, and time required to the ſowing of their Seeds be firſt declared: I ſhall therefore wave all ſuch endeavours, and haſten to what may rather prove for uſe than pomp.

Num. 2. *That Nature gave a ſpecimen of this way of Propagation.*

Nature ſurely of this firſt and greateſt ſpecies of Propagation, though it would not undertake the whole work, yet gave us the firſt Hint. So *Lucretius lib.* 5.

At ſpecimen Sationis ———
Ipſa fuit rerum primum Natura creatrix,
Arboribus quoniam Baccæ, glandeſque caducæ
Tempeſtiva dabant pullorum examina ſubter.
——— *Thus Natures All-creating Hand*
Gave the firſt Hint to Men of Sowing land;
For fruits and Akorns *dropping ripe, did bring*
Forth Timely ſprouts for the ſucceeding Spring.

But

But seeing that this species of Sowing will not suit with all Plants, it will be expedient to annex a Catalogue of those Plants that Experience hath taught us here in *England* to propagate this way.

A Catalogue of Plants that may be encreased by Seeds.

Aconite.
F. Adonis.
Allisanders.
Alkanet.
Alaternus.
Alliaria.
Almonds, the bitter from our *English* Fruit, serving for his own kind, or to make stocks for Aprecots & Peaches.
Ammi.
Amaranthus.
Angelica.
Anemones.
Aprecots.
Aparine.
Apple-trees of all sorts.
Apples of Love.
Arsemart.
Armerias.
Archangels.
Aristolochia.
Ash.
Asparagus.
Asphodels.
Avens of all sorts.
Balm Apple.
Balsamina.
Basil.
Balm.
Barberies.
Bay-Trees.
Beech.
Beans.
Bears-ears.
Betony.
Bell-flowers.
Beets.
Bistort.
Bitter Almonds.
Blice.
Blew-bottle.
Bloodwort.
Bryonies.

Bulbous

Bulbous Violets.
Burrage.
Bugloſſe.
Burdock.
Burnet Saxafrage.
Burnet.
Burrs.
Buckthorn.
Bullets of all ſorts.
Cabbage Plants.
Campions.
Carnations.
Calamint.
Camomile.
Caucalis.
Carrots wilde.
Carrots.
Caraway.
Carduus Benedictus.
Centory.
Celandine.
Chickweeds.
Chondrillas.
Chervil.
Cherries.
Cheſnuts.
The *Cornelian Cherry.*
Cichory.
Citrulls.
Ciches.
Claries.
Coleworts.
The Seeds of *Clematis*, but it comes not up till the ſecond year.
Coleflower.
Corn of all ſorts.
Corneflag.
Coronopus Ruellii.
Comfrey.
Corianders.
Columbines.
Convolvulus major, minor, and other Bind weeds.
Cornſallet.
Coronopus.
Moſt ſorts of *Cowſlips.*
Crown Imperial.
Cranes-Bills.
Crowfoot of moſt ſorts
Cucumbers.
Cumin.
Cyclamens.
Cypres from out-landiſh ſeed.
Dandelion.
Dames Violet.
Some *Dayſies.*
Diers Weed.
Dittander.
Divels-bit.
Dittany.
Dill.

Docks

Docks.
Dogs-bane.
Earth-nut.
Egrimony.
Elecampane.
Endive.
Epatica's.
Eupatorium cannabinum.
Evergreen Privet.
Ewe.
Feverfew.
Fennel-flowers.
Fennel.
Fenugreek.
Figwort.
Fig-trees.
Fibberds.
The Firre-Tree.
Some Flags.
Flowers-de-Luce.
Flos Adonis.
Flaxes.
Fleabane.
Fluellens.
Foxgloves.
Frittelaries.
French-Mallows.
Fumitery.
Garlick.
Garden-cresses.
Germanders.
Ginny.
Gilly-flowers.
Globe-flowers.
Gourds.
Most of our English Graſs; to this end, Husbandmen uſe hay duſt (as they call it, in which lie the ſeeds of their graſs) to ſow upon ſuch Grounds as they mean to turn from fallow into Paſture, or where they would have the graſs grow thicker.
Grain of all ſorts.
Groundſel.
Groundpine.
Gromwell.
Hawkweeds.
Hartwort.
Hawthorn.
Haſelnuts.
Henbane.
Hemp.
Hellebores.
Hercules his all heal.
Hyacinths.
Holy-oke.
Horſe-radiſh.
Horned-Poppy.
Hony-wort.

Hore-

Horehounds.
Hounds-tongues.
Holyoke.
Honysuckles.
Holly or *Holme.*
Hypericum.
All *Hyssopes.*
Indian Pepper.
Ironworte.
Juniper.
Kidney-beans.
Knapweed.
Knot-grasse.
Ladysmocks.
Lamb-lettuce.
Lark-spurs.
Lavander.
Langdebeefe.
Leeks.
Some *Lillyes*, though but few.
Lychnis Calcedonica.
Linum umbellatum.
Lovage.
Lupines.
Marjoranes of all kinds
Mandrakes.
Mastique.
Common *Marygolds.*
Mallows.
Marbleflower.
French and *African Marigolds.*
Marshmallowes.
Masterwort.
Maple.
Malacotones.
Melons.
Melilot, and its kinds.
Medlars.
Mercuries.
Molyes.
Monkshood.
Motherworte.
Mustard.
Muscipula.
Mulleines.
Mulberries by Seed from hotter climates than our own; for our heat ripens not the seed ordinarily, yet I have seen at M. *Stephens* of Langford a Case of young Mulberry-trees all raised from English seed.
Mirtles likewise.
Narcisses.
Dead-Nettles.
Stinging-Nettles.
Noli-me-tangere.
Nightshades.

Nigella.

Nigella.
Oke.
Oke of Paris.
Onions.
Some of the *Orchis* of stones.
Orach.
Orpines.
Paronychia.
Pancies.
Peucedanum.
Parsley.
Parsnips.
Panax Herculeus.
Pellitory.
Pennyworts.
Peonyes.
Pease.
Pease everlasting.
Pears.
Peaches.
Periclemenum.
Philarhæa.
Pinks.
Pimpernel.
The *Pitch-tree.*
Plums.
Plantains.
Wild & garden *Poppies.*
Pondweed.
Pompions.
Primroses.
Ever green *Privet.*
Pulsatillas.
Purslane.
Quinces.
Radish.
Ragworte.
Rampions.
Radix-cava.
Reeds.
Ribwort.
Rosemary by Out-landish-seed, sometimes by our own.
Roman Nettles.
Some *Roses*, the Flower being not gathered, but left to seed.
Rocket.
Rushes of many sorts.
Rue of all sorts.
Some of the *Saffrons*, and *Mede-Saffrons*, whose seeds lyes under the earth.
Satyrions.
Savory.
Sabina baccifera.
Scorpion grasses.
Scurvey grasse.
Scorodonia.
Scabiouse.
Scorzoneca, but, it

comes up with some difficulty.
Seseli æthiopicum, or *Hartwort.*
Sesamoides.
Shepheards purse.
Skirrets.
Sloes.
Smalladge.
Sneezewort.
Snapdragon.
Sowthistle.
Sorrels.
Spiderwort.
Spinach.
Spurges of many kinds.
Spignel.
Stichwort.
Starre-flowers.
Stockgilliflowers.
Starrewort.
Flowers of the Sun.
Sword-flags.
Swine-cresse.
Swallow-wort.
Sycamores.
Tarragon.
Teasels.
Terræ-glandes.
Thorney Apples.
Thorough-wax.
Thyme, both the Winter and Summer sort.
Thistles.
Tobacco.
Thlaspies.
Toad-flaxes.
Tragopogon.
Trefoile, and its kinds.
Tulips.
Turnips, and all its wilde kinds.
Tutsan.
Venus Looking-glass.
Vervain.
Vetches.
Violets.
Vipers-grass.
Virgine-bower.
Umbilicus-Veneris.
Vines from Out-landish seed.
Water-betony.
Water-lilly.
Wallnuts.
Winter-cresse.
Winter-cherries.
Willow-weeds.
Woolfs-bane.
Wormwood.
Woodroof.
Wood-sorrel.
Woad.

There

There is a great controversie concerning *Harts-tongue*, *Maydenhair* of divers sorts, *Scolopendrium*, *Fernes*, and other Plants, whose property is to have the back of the leaf lined with a brown dusty substance, whether this substance be a seed, or onely the particular mole, and character of Plants of that nature.

Quare of Harts-tongue, Maiden-hair, Fern, Scolopendrium.

I dare not disbelieve this (when perfectly ripe) to be a true seed, because divers, very experienced persons (as Mr. *Bobart* particularly) affirm, that they have seen the small Plants, or Seedlings, at a distance all round the Mother-plant grow up as is ordinary from shed seed of other plants, and by *Miscroscopes*, the likeness of this dust to other seeds is apparently seen.

Num. 3. *The Seasons of Sowing.*

First, the most natural time of Sowing, is that which Nature it self follows, (*viz.*) when the seeds of their own accord fall into the ground.

At this Season may be sowen all stony seeds that can endure the Winter, as Cherries, Plums, Peaches, Apples, Pears, likewise all Nuts, Buckthorne, Ash, Oke, and most wild English Plants, though they may as well be sowed any time before the Spring.

The seed of hot, and sweet herbs, as

Thyme, Savory, Marjerome of some kinds, and other hot hearbs, if they get any reasonable strength and growth before the frosts, do well enough; also Muscabious Angelica seed, Scurvey-grass, and the seeds of Bears-hears, Aniseed, Fritellary, Crocus, Corne-flags; and, for ought I know, all the rest of Bulbous-rooted-flowers: So Tulips and Anemonies thrive best, and come sooneſt, being sowed after the seeds are gathered, or in Autumn: For many *October* does well, but care must be had to keep tender Plants from Frosts and the violence of Winter weather, when they are but young from the Seedlings. If you doubt the nature of any seed, divide your quantity, and sow some of it in the Spring, some before the Winter.

At this time also must be sowed divers Plants, because that by experience it is found, that being sowed in the Spring, they wil not grow, or at least not that year: Of this kind is Myrrhis, or sweet Chervil, and all Rubarbs, which easily grow then, but faile being sowen in the Spring.

The mistake of the time has made some admire, that when they with care had sowed Angelica seeds several times together, it never grew; on the contrary, the Seed being shed, would grow in any place, never so uncouth or stony; nay even carried away by the water, would grow where ever it was lodged in the banks, and that well and lustily;

whereas

whereas the reason of the difference was in the season, for the laborious Artist kept the seeds till Spring, and his Delay was his hindrance, whereas better instructed Nature would have committed them to the Earth many months sooner. 'Tis a true Proverb, *Properata satio solet sæpe decipere, sera semper.*

Wheat is sowed generally about *Michaelmas* or within a Month before, and from that time until *Allhallowtide*, sooner or later, according to the lightness or warmness of the ground. Some sorts of Barly also there are that will endure the Winter, as the *Hexastick* particularly, or Barly that carrieth six Rowes of Grain in the Ear, which *Gassendus* mentions to be an usual grain in in *Champaign* of *France*, and which I have seen ordinarily growing in *England:* But it requireth a good soyl, and must be sowed about *Allhallowtide*: I take it that it would be a great improvement to sow it in our richest new broken grounds. It will not agree with a soyl that is hungry.

Cornesallet is usually sowed in the beginning of *September* in good earth, the seed Leing sound and new, and it will be cut by the next *March* for sallets, it flowers in *April*, and the seed is ripe in *June*, if you let the seed scatter, it will grow naturally.

Some seeds are sowen at the breaking of the Frost, and in the very first beginning of Spring, and that upon a hot bed, for the

greater security and speed of the Plant to be propagated: So the early Radish, the Sensitive Plant, Maracoc, Jacobæa, Balm-Apples, French-Marygolds, Muskmelons, all Cucumbers, African-Marygolds, the Marvail of the world, the Indian Cress, or yellow Larksheel, Lettices that may be had early; Amaranthus and divers others of like kinds.

The hot Bed is made with horse-dung, laid four, five, or six foot high, and of the same breadth commonly, increasing or diminishing the quantity of the dung (which uses to be fresh, as it comes from the Stable, mingled with stale Litter, Hay, &c.) according as you would have the heat greater or less, upon which Bed of dung you lay fine mould, five fingers breadth in deepness, or thereabouts, compassing it round with hay-bands which keep the Dung together, and hinder the steaming out of the heat by the sides; then staking it up with stakes, and putting bended sticks in the manner of a very low roof, to hold up tilts that are put to secure the Plants, the hot bed is compleatly finished. Those that use Cap-glasses, or Casements made to lye upon a frame over their beds, nevertheless must use, though not tilts, yet covering with straw, litter, or the like.

Some use only Barly-straw, or Barly-straw and Bran for their hot beds, and think them best both for raising the Annual plants and Melons also, because Horse-dung gives a rank-

rankness to all esculents, and besides forceth the Germination too soon, and doth not continue that heat by which the Plant was forced up.

Asparagus and Chervil are best sown in Winter, before Christmass, or shortly after, and in the beginning of Spring, without any hot bed.

In *February*, or afterwards, are sown Parsnips, Leeks, Onions, Aniseeds, Carrets, Radish, Spinage, Larks-spurs, Marygolds, Cærefolium, Corn-sallet, and with the first of these the Rounseval pease. For as *Virgil* truly writeth,

Vere fabis satio; tum te quoque, Medica, putres
Accipiunt sulci. Virg. Georg. 1.
Beans sow in spring: then Clave-grass rich
(earth takes.

Colliflowers and Cabbages in the middle of *February*, Muskmelons somewhat after, or then for a venture. 'Tis observ'd by all I have enquired of, that the less of the Winter the Cabbage or Collyflowers feels, the more subject 'tis to Caterpillars. In *March* or *April* (or according to some with us, from the beginning of *February*; or if the Frosts break, any time in *January*) Carrot, Radish, Tobacco, Fennel, Cresses, Skirrets are ordinary sowen.

In *April* are usually sowed Marjerome, Basil, Coleflowers; for by often transplanting and care, you may have Coleflowers from seed,

sowed in the Spring, though it be very far gone, even to *June* or *July* the same year, Pincks, Armeriaes, Convolvulus, Kidney-beans, Lupins, Hyssope, Lavender, Stock-gillyflowers, Thyme, Hemp.

About the latter end of *April*, Purslane, Clove-gilliflowers, Carnations, Basil, Rose-mary, Oke of Paris.

About *Midsummer* sow the early Pease, to be ripe six weeks after *Michaelmas*.

Note that our Gardiners, though there be some peril, chuse to sow early, because they have much advantage by all sorts of forward commodities; so Turnips being sowed early, many of them run to seed, yet one good then, is worth three at another season. The same may be said of Pease and Carrets, which by cold are spoyled many times; yet it is observed by some, that oftentimes, whether by difference of ground, or other accident, the Bean latter sowed will overtake the former, and so in some sort of Pease.

About the middle of *July*, when the Mese-reons berries are first ripe, they are to be sowed, they come not up until the second Spring after their being sowed, and a year or two after are removed, all which time they require no other attendance besides weeding.

Many seeds are best sowen about *August*, so Turnips, and the black Radish, for a peculiar reason; which is, being sowen sooner, they are apt to run up to seed before Winter, and

not

not to fill the root at all. Onions for Winter provision, Lettice and Corn-sallet for the same occasion; Spinage too, always upon that account, though otherwise they may be sowed with the first. Nay, our Gardiners here in *Oxford* sow Turnips in *April*, and so forward till the Winter.

Cabbage plants are sowed commonly about *August*; and the first Coleflowers, that they may before Winter be so grown, as to be transplanted at greater distance, so to abide till the Spring. I have known some, when frost has spoyl'd the winter Cabbage-plants, to have furnished themselves from plants raised in the Spring upon a hot bed.

Many seeds must be gathered a little before they are throughly ripe with the stalkes on which they grow; for should it abide until the full maturity in the Garden, by wind and weather great part of the seed would be shed, which will easily perfect its ripeness as it lyes cut upon its stalk, being laid any where within doors upon a cloath or mat where the Sun comes Of this kind is Lettice, and most of those seeds that arise from the stock with a woolinesse.

There are many Plants that will grow in all times of sowing, and therefore are sowen many months, one after another; so Radishes, and Spinach, and Pease, which are sowen with the first in the Spring; and so month after month till Autumn. Those Lettices which abide

abide the Winter, are wont to be transplanted to Cabbage in the Spring, even as Cabbages are with admirable success.

Our Gardiners, that they may have Cucumbers to sell one under another, plant them in hot beds from *February* even till *May*.

Pease are sowen from the beginning of *November* (or by some a fornight before, though with some danger of the biting frost) and so forward till after *Shrovetide*.

The General Use for sowing of the early Pease, is to chuse a light warm ground, and to sow the first about the beginning of *November*, where their fields are large, Gardiners generally Plow their ground, and then harrow it well, and after that, draw pretty deep furrows with their howes, and cover their Pease therein. The sooner they sow their Pease, the deeper they make their furrows to preserve the root from the cold; assoon as these Pease are gathered, they Plow the ground again, and sow it with Turneps, for which, by the Pease, the ground is well prepared, and for the sowing of which, that season of the year doth best agree.

Rounsevals, if sowed never so early, will scarce come before the latter part of the Month of *June*.

Husbandmen generally use to sow Wheat under furrow in the Autumne; but I have seen it in rich and warm ground with good success sowen in the Spring, and harrowed

in

in after the manner of sowing Barley; the crop being as good as any other times upon the same ground, after the usual country procedure.

Some seeds must be sowen dry, not after rain or watering: Of this kind is Myrrhis seed, Basil, Scorzonera, and all such as being wet run to a Muscilage.

Many times they sow divers seeds in a Bed together, as Radishes and Carrots, that by such time as the Carrots come up, the Radishes may be gone. Upon beds newly set with Licorice, they sow Onions or Radish, or Lettice if their Licorice plants or ground be but weak, so as not quickly to cause a shadow with their leaves. *London* Gardiners sow Radish, Lettice, Parsley, Carrots, on the same bed, gathering each in their seasons, and leaving the Parsnips till the Winter; before which time they are not esteemed good, or wholsome.

Question. *Concerning the mixing of several kinds of Seed, and sowing them in the same bed?*

I confess it may be a question whether there is not in some cases more caution to be used, and in others more improvement to be made then is vulgarly imagined in the setting Plants of different Natures in greater propinquity or Distance. For it is an Observation of the learned *Gassendus*, that not onely hot herbs

herbs are made more cold, or brought nearer to a temperament, by being sow'd or planted in a cold soyle, and cold herbs made more hot by being placed in a hot soyle, but also that cold herbs being sow'd near hot ones, become more temperate: For example, that the coldness of Lettuce is corrected by being sow'd among Onions. *Lib. de Plantis cap.3. de Facultatibus Plantar.* and afterward in the same Chapter, That if you set white *Hellebore*, or the herb *Mercury* near a Vine, the Grapes will acquire a purging Faculty. And it is an Observation of *Dodonæus lib.* 5. of his History of Plants, cap. 37. where he describeth his *Raphanus Montanus*, or *great Mountain Radish*, That it hath been found by experience, that this Plant doth hinder the growing of the Vine, and being Planted near it, doth cause the Vine to starve, or wither away, which property some of the antient writers ascribe to Coleworts. *Pliny l.*17.24. asserts the same concerning Vines. His words are, *Quarundam plantarum Odor ledit Vites, sicut Rhaphanus & Laurus. Olfatrix enim intelligitur Vitis, & tangi Odore mirum in modum. Ideoque cum juxta sit averti & recedere, saporem inimicum fugere, Odit & caulem & olus omne, Odit & Corylum ni procul absint, tristis & egra.* And this agrees with *Virgils Georgicks.*

Neve inter vites Corylum sere----

Nor plant rough Hazels 'mongst the tender Vines.

Note,

Note, that where your grounds are very warm by reaſon of hedges, hot beds, dunghils, *&c.* that may abate the power of the froſt, ſeeds may be ventured into the ground much ſooner than otherwiſe in ordinary places.

Cabbage ſeeds and Coleflowers are ſowed in *Auguſt*, or ſo timely as to be exactly well rooted Plants before winter; and this is the beſt way: Or are ſowed after, ſo that they are tranſplanted in the time of cold. This way is hazardous in the winter, by reaſon of the nipping Froſts, and chargeable, in that they require much attendance, and covering, and uncovering, which thoſe Plants that are confirmed before winter do not. Secondly, they are more ſubject to Caterpillars in the Summer; but the way of raiſing of them by hot beds in the Spring for Cabbages is the worſt way of all, and moſt ſubject to the peril of that vermine.

Thoſe Plants of the Spring ſowing, that you ſow later than ordinary, require to be the more watered & ſhadowed from the heat.

Thoſe in the Spring that are ſowed earlier than ordinary, require the more to be defended from the cold.

Thoſe in the Autumne, that you prematurely ſow, are to be watered and ſhadowed the more. Thoſe which you ſow late are to be better defended from the Winter till they have gotten ſtrength.

Num.

Num. 4. *Examples of Sowing with some particular directions for some choice Vegetables.*

Examp. 1. *From* Mr. Parkinson *and* Mr. Rea, *directing skillfully the ordering of* Tulips *in their propagation by seed.*

Sowing of Tulips. The first example I shall give you out of Mr. *Parkinson*: The time (says he) and manner of Sowing Tulip-seed is thus: you may not sow them in the Spring of the year, if you hope to have any good of them, but in the Autumne, or presently after they be through ripe and dry; yet if you sow them not until the end of *October.* they will come forward never the worse, but rather the better; for it is often seen, that over-early sowing causeth them to spring out of the ground over-early, so that if a sharp spring chance to follow, it may go near to spoyl all, or most of the seed: We usually sow the same years seed, yet if you chance to keep of your own, or have of others, such seed as is two years old, they will thrive and do well enough; Especially if they were ripe and well gathered: you must not sow them too thick, for so doing hath lost many a Peck of seed; for if the seed lie one upon another, that it hath not room upon the sprouting, to enter or take root in the earth, it perisheth by and by; Some use to tread down the ground where they

they mean to ſow their ſeed, and having ſowen them thereon, do cover them over the thickneſs of a mans Thumb, with fine ſifted earth, and they think they do well, and have good reaſon for it: For conſidering the nature of young Tulip-roots is to run down deeper into the ground, every year more than other, they think to hinder their quick deſcent by the faſtneſs of the ground, that ſo they may increaſe the better. This way may pleaſe ſome, but I do not uſe it, nor can find the reaſon ſufficient; for they do not conſider that the ſtifneſs of the earth doth cauſe the roots of the young Tulips to be long before they grow great, in that the ſtiff ground doth more hinder the well thriving of the Roots then a looſe doth: and although the roots do run down deeper in a looſe earth, yet they may eaſily by tranſplanting be holpen, and rais'd up high enough. I have alſo ſeen ſome Tulips not once removed from their ſowing to their flowering; but if you will not looſe them, you muſt take them up while their leaf or ſtalk be freſh, and not withered: for if you do not follow the ſtalk down to the root, be it never ſo deep, you will leave them behind you.

The ground alſo muſt be reſpected, for the finer, ſofter, and richer the mould is, wherein you ſow the ſeed, the greater ſhall be your increaſe and variety. Sift it therefore from ſtones and rubbiſh, and let it be either fat natural

tural ground of it self, or being muckt, let it be throughly rotten: some I know to mend their ground, do make such a mixture of grounds, that they mar it in the making.

Ferrarius bids that the seed be sowen in *September*, (as soon as rain shall make the ground fit) half a fingers breadth in good Garden-mould, not to be removed in two years after, at which time they are to be removed and placed in several beds, according to their several bigness, where in 4 or 5 years they will bear their flowers.

Mr. Parkinsons *way of ordering the seedlings of Tulips.*

After the Tulip-seed is sown, (saith Mr. *Parkinson*) the first years bringing, bringeth leaves little bigger then the ordinary grass leaves; The second year bigger, and so by degrees, every year bigger then other. The leaves of the præcoces, while they be young, may be discerned from the Media's, by this note which I have observed, The leaves of them do stand above ground, shewing the small foot-stalkes whereby every leaf doth stand; but the leaves of the Media's or Serotines do never wholly appear out of the ground, but the lower part which is broad, abideth under the upper face of the Earth.

Those Tulips now growing to be three years old (yet some at the second year, if the ground and air be correspondent) are to be taken up out of the ground (wherein you shall

ſhall find they have run deep) and be new planted after they have been a little dry'd and cleanſed either in the ſame or another ground, again placing them reaſonable near one to another, according to their greatneſs, which being planted and covered over with earth again, of about an inch or two thickneſs, may be left untaken up again two years longer, if you will, or elſe removed every year after, as you pleaſe, and thus by tranſplanting them in their due ſeaſon (which is ſtill at the end of *July*, or at the beginning of *Auguſt*, or thereabouts) you ſhall according to the ſeed and ſoyle, have ſome come to bearing in the fift year after their flowering, ſome have had them in the fourth: (but that hath been but few, and none of the beſt, or in a rich ground) ſome in the ſixth and ſeventh, and ſome peradventure not until the eighth or tenth year. But remember that as the roots grow greater, that in the planting you give them the more room to be diſtant one from another, or elſe the one will hinder (if not rot) the other.

The ſeed of the Precoces do not thrive and come forward ſo faſt as the Media's or Serotines, nor do give any off-ſets in their running down, as the Media's do, which uſually leave a ſmall Root at the head of the other that is run down every year; and beſides are more tender, and require more care and attendance then Media's, and therefore they are the more reſpected.

This is a general Rule in all Tulips, that all the while they bear but one leaf, they will not bear flower, whether they be ſeedlings, or the off-ſets of elder Roots, or the Roots themſelves, that have heretofore born flowers; but when they bear a ſecond leaf, breaking out of the firſt, it is a certain ſign that it will then bear a flower, unleſs ſome caſuality hinder it; as Froſt or Raine, to ſpoile or nip the bud, or other untimely accident befall it.

To ſet or plant the beſt and bearing Tulips ſomewhat deeper then other Roots, I hold it the beſt way. For if the ground be either cold, or lye too openly in the cold Northern aire, they will be the better defended therein, and not ſuffer the froſt or cold to peirce them ſo ſoon, for the deep froſts and ſnows do pinch the Precoces chiefly, if they be too near the uppermoſt cruſt of the Earth, and therefore many with good ſucceſs cover over their ground before Winter, with either freſh or old rotten dung, and that will marvellouſly preſerve them. The like courſe you may hold with ſeedlings, to cauſe them to come on the forwarder, ſo that it be after the firſt years ſowing, and not till then.

To remove Tulips after they have ſhot forth their Fibres or ſmall ſprings which grow under the greater round Roots (that is from *September* until they be in flower) is very dangerous, for by removing them when they have taken faſt hold in the ground, you do hinder

hinder them in the bearing out their flower, and beſides put them in hazard to periſh, at leaſt to be put back from bearing a while after as often I have proved by experience, but when they are now riſen to flower, and ſo for any time after, you may ſafely take them up if you will, and remove them without danger, if you have any good regard to them, unleſs it be a young bearing Root, which you ſhall in ſo doing much hinder, becauſe it is yet tender by reaſon it beareth now the firſt flower, but all Tulip Roots, when their ſtalk and leaves are dry, may moſt ſafely then be taken out of the ground, and be ſo kept (ſo that they lie in a dry, and not in a moiſt place) for ſix months without any great harm, yea I have known them that have had them nine months out of the ground, and have done reaſonable well, but this you muſt underſtand withal, that they have not been young, but elder Roots, and have been orderly taken up and preſerved; the dryer you keep a Tulip root, the better, ſo as you let it not lie in the Sun or the Wind, which will pierce and ſpoile it.

Commonly (ſaith Mr. *Rea*) we make choice of ſuch as we intend for ſeed, when they are in flower, but in ſo doing, we often fail of our purpoſe, for that the roots looſe their fibres, and the ſtalks dry before the ſeeds come to be half ripe; to prevent which, make choice of the ſtrongeſt roots you have,

of ſuch flowers you deſire to ſeed, and ſet them in that part of your garden moſt expoſed to the ſun ſix or ſeven inches in the ground; by which means you may gain good ripe ſeeds from almoſt any flower, as I have found by experience.

About the middle of *July*, ſooner or later, as the Summer is hotter, the ſeeds will be ready to gather, which may be known by the dryneſs of the ſtalks, and the opening of the ſeed veſſels: which gather, and take up the roots, letting the ſeeds remain in the pods, till the end of *September*, and then take them out, which being cleanſed from chaff, may be ſowed in beds of fine ſifted earth, eſpecially the more ordinary ſorts; but thoſe of the choiceſt flowers muſt be ſowed in boxes filled with the fineſt earth that can be gotten, in reſpect the young roots are apt to run down deep in the earth, ſo that in beds many of them will be loſt: ſow not theſe ſeeds too thick, nor cover them more then a finger thick; in *March* following they will come up with ſmall leaves like graſs, and in *April* weed and gently water them, as often as you ſhall find occaſion. About Midſummer, two years after the ſowing, you may take them up, cleanſe the ſmall roots, and ſet them again in rows at a wider diſtance, and ſo every other year until they come to bear flowers, ſtill altering the earth with freſh earth, and ſifted Compoſt before you ſet them again; It will be

be six or seven years before the Præcoces will bear flowers, but the Media's a year or two sooner; when you see the flowers, mark out the best, and give them new names, casting away the common Reds, Yellows, and Purples, and reserving such self-colours chiefly as are light with blew purple, and black bottomes and Tamis, for such often change into fairer flowers, and better marked then many that shew their best at first flowring.

Example 2, *Of Anemone's.*

Within a month after the seed of Anemone's is gathered and prepared (in *August*, says *Ferrarius*, or three days before the full Moon in *Septemb.*) it must be sown, for by that means you shall gain a year in the growing, over that you shall do if you sowed it the next spring: If there remain any woolliness in the seed, pull it a sunder as well as you can, and then sow your seed reasonably thin upon a plain smooth bed of fine earth, or rather in pots or tubs, and after the sowing, sift or gently strew over them some fine good fresh mould, about one fingers thickness at the most for the first time; and about a month after their springing up, sift, or strew over them in like manner (this is a necessary circumstance) another fingers thickness of fine earth, and in the mean time, if the weather prove dry, you must water them gently and *Sowing of Anemone's.*

often, and thus doing, you ſhall have them ſpring up before Winter, and grow pretty ſtrong, able to abide the ſharp Winter in their Non-age, in uſing ſome little care to cover them looſly with Fearn, Furz, or Bean-ſtraw, or any ſuch things, which muſt neither lie cloſe to, nor too far from them.

The next Spring after the ſowing, or which is better the next *Auguſt* you may remove them, and ſet them in order by Rowes, with ſufficient diſtance one from another, where they may abide, until you ſee what manner of flower they will bear.

Many of them being thus ordered, if your mould be fine, looſe and freſh, not ſtony, clayiſh, or from a middin, will bear flowers the ſecond year after the ſowing, and moſt or all of them the third year, if your ground be free from ſmoaks and other annoyances. Nay Mr. *Auſten* of *Wadham Coll.* a skillful Floriſt, aſſured me that he has had Anemones from the ſeed ſowed in Summer, that were in flower within ten months of the time of their ſowing.

Num. 3. *Example the 3d of Auricula's which is applicable to the choiceſt Primroſes & Cowſlips.*

Our great Floriſt, Mr. *Rea*, being very particular in his Rules concerning the raiſing of Auricula's, I ſhall add from him a third example. After (ſaith he) the flowers are paſt, and

and the ſtalks begin to grow yellow, you may obſerve in the top of that little round ſeed veſſel a ſmall hole, and then you may be aſſured the ſeed is almoſt ripe, and if you do not carefully look to it, will be all ſhed before you are aware; therefore as ſoon as you perceive it to be ready, cut down the ſtalks, keeping the Tops upright, for if you turn them downwards, all the beſt ſeeds will fall out; then bind them into bundles, and place them upright to the glaſs of ſome *South* window, where (by ſome benefit they will receive by the Sun) they will harden, and be much the better; Towards the end of *Auguſt*, or beginning of *September*, prepare ſome ſquare box or boxes according to your ſtore of ſeeds, that are nine or ten inches deep, and of what breadth you pleaſe, with ſome holes in the bottom to let out water; which fill three parts full of fine ſandy ſifted Earth, one half thereof being well rotted Neates dung, which mingled well together, and laid ſmooth with a Trowel, lay thereon a fingers thickneſs of fine ſifted Willow earth, or for want thereof dryed Cow-dung beaten ſmall, mingled with a little good Earth, and ſifted, ſow your ſeeds thereon mingled with Wood-aſhes, which by their colour will direct you to ſow them the more ſuitably; they muſt not be ſowed too thin, for all will not come up, if they do they may eaſily be removed to another place; after the ſeeds are thus ſowed,

cover them half a finger thick with the ſame you put next under them, which preſs down lightly, and let them remain in the Sun and Air until they begin to come up, which will be about *April*, and then they muſt be removed into the ſhade, and often gently watered; aſſoon as they are brought to any conſiderable bigneſs, take ſome of them up, where they are too thick, and ſet them preſently in ſome bed prepared for that purpoſe, ſix or eight inches aſunder, where they may remain until they come to bear flowers; Thoſe you leave in the box may be tranſplanted in the end of *Auguſt* after the ſame manner, and ſo the box will be ready again to ſow more ſeeds; ſome of them will bear the Spring following, others about *Auguſt*, the year after they are ſowed, and the reſt the Spring then next following, provided the ground you ſet them in be rich and good, otherwiſe you will looſe all the delight of your labours. Some are of Opinion, that the beginning of *October*, others the end of *February*, is the beſt time to ſow them, but having tryed all thoſe times, I find that before mentioned to be the beſt; For the ſeeds are ſo ſmall, that if they be kept any time out of the ground they will be all dead. Now above all things, you muſt be ſure to get the ſeeds of good flowers, for from thence ſpringeth all your hope, when you ſee their flowers, thoſe you diſlike caſt away, and keep the reſt for your uſe.

Num. 4.

Num. 4. *Clovergrass being esteemed as great an improvement as any our ground is capable of: I shall add such special directions as are given for the ordering thereof: Sir* Richard Weston's *observations and rules are as followeth.*

Clover-grass.

Clover-grass-seed thrives the best when you sow it in the worst and barrenest ground. Such as our worst heath ground in *England*. The ground is thus prepar'd for seed.

First pare of the heath; then make the paring into little hills: you may put to one hill as much paring as comes off from a Rod or Pole of ground, which is the square of sixteen feet and a half. The hills being sufficiently made and prepared (as they do in Devonshiring as they call it) are to be fired and burnt into ashes. And unto the ashes of every hill you must put a peck of unslaked Lime; the Lime is to be covered over with the ashes, and so to stand till Rain comes and slakes the Lime. After that mingle your ashes and Lime together, and so spread it over your Land. This done, either against, or shortly after Rain, Plow and Sow; ploughing not above four inches deep, and not in furrows, but as plain as you can, and to make it yet plainer, Harrow afterwards, and that with Bushes under your Harrows.

The ground being thus prepared, you may sow

sow your seeds. An Acre of ground will take about ten pounds of Clover-grass-seed, which is in measure somwhat more then half a Peck. The chief season for sowing it is *April*, or the latter end of *March*.

About the fift of *June* it will be ready to be cut. It yields excellent hay. The time of cutting it will be more exactly known, by observing when it begins to knot; for that is the time: And ere the year be done, it will yeild you three of those crops, all of them very good hay; and after you have thus cut it the third time, you may then feed the ground with Cattle all the Winter, as you do other ground.

But if you intend to preserve seed, then must you expect but two Crops that year, and you must cut the first according to the foresaid directions, but the second growth must be let stand, till the seed of it be come to a full and dead ripeness, and then must you cut it, and thresh the tops, and so preserve the seed, you shall have at least five bushells of seed from every Acre.

This seed thus threshed off, there will be left long stalks, these your Cattle will eat; but when they grow old and hard, you are to boile those stalks and make a mash of them, and it will be very nourishing either for Hogs, or any thing that eat thereof.

After the second cutting for seed, you must cut that year no more; but as it springs a-

gain,

gain, feed it with Cattle. One Acre of it will feed you as many Cowes as six ordinary Acres, and you will find your Milk much richer; which induces some not to cut it at all, but only to graze it for their Dayry.

Being once sowed, it will last five years, and then being plowed, it will yeild three or four years together rich crops of Wheat, and after that a crop of Oats.

And as the Oats begin to come up, then sow it with Clover-seed (which is in it self excellent Manure) for you need not bestow any new dressing upon the ground, and by that time you have cut your Oates, you will find a delicate grass grow up underneath, upon which, if you please, you may graze with Cattle or Horse all that year, and the next year take your Crop as before at pleasure.

To prevent mistake, I must give this advertisement, that whereas Sir *Richard Weston* commends Heathy ground, he is not to be understood, of such dry and barren ground without its best Manure by chalk, lime, and the like artifices of Husbandry. For otherwise it has failed in the growth and improvement thereby expected. Mr. *Blith* commends ground naturally good, betwixt tenne and twenty shillings an Acre: giving this general Rule, that no land can be too good for Clover that is not too good for Corn.

Hemp and Flax are used to have the same culture, and the best Husbandry *Hemp. Flax.* that

that I have obſerved of them has been in *Staffordſhire*, where this procedure is generally obſerved. About the beginning or middle of *April*, the Flax-ſeed is ſown upon new broken ground, immediately upon it s being broken up. The ſeed they either have from their own Crop, or buy it from a warmer Country: Mr. *Blith* reports the true Eaſt-Country ſeed to be far the beſt, who for tryal of both, ſowed on the ſame land, the Ridge or Middle with our Country-ſeed, and both the furrows, with Dutch or Eaſt-country ſeed, (ſuch as is bought in the Seedmens ſhops at *Billingſgate* in *London*) the effect was that our ſeed, though on the ridge it had the advantage of the ground, was encompaſſed with the Dutch, as with a wall about it, ſo much the Eaſtern-ſeed did out grow it. He likewiſe for warmer parts, as *Eſſex* and *Kent* thinks *mid-March* a convenient ſeaſon for ſowing it: If weeds grow therein, they carefully weed their Crop, and pull it in dry weather, when it looks yellow, (leſt growing over ripe, it blacken and mildew) and tye it up in handfulls, that it may perfectly dry. Then they riple it, that is, they get out the ſeeds by drawing it through an Engine like an Iron double tooth'd Comb, which they call a Ripple: the boles of ſeed pulled off, they lay on a boarded or plaiſter'd floor to dry, it being dryed, they lay it up, and threſh it not out of the boles till *March*, when they winnow it clean from the husks. The

The watering of it is thus; The Flax being well dryed, they bind up about 20 handfulls in a bundle, and putting many of these bundles together, they stake them down in the water, that they may not be carried away by the Stream. The Flax abides in water 4 or 5 dayes and nights, then they spread it on the grass that it may be dry, turning it every three days, and when it is full dryed, then lay it up and house it, and when they see their occasion they use their Brake and Crack, instruments devised for the purpose to bring the Tow from the Flax. The whole Government and Husbandry of Hemp, from the Seed to the Distaff, is so like this of Flax, that the same example and rule may very well serve for both.

Tobacco.

Tobacco is a Native plant in the hot parts of *America*, and there prospers best in shadowy places. For the extream heat of the Sun would cause the leaves to fade. But in these Countries the hottest situation is most proper for it; and it is best ordered thus. Gather your Seed from the bottom of the Plant, and sow it as early as you can after Christmas on a hot bed, (not in *September* as *Everard* and *Magnenus* direct) and so produce your Plants until they be as big as Cole-flower-Plants.

In your transplantation of them, chuse the richest soile that can be made, none can be too rich if the Dung be perfectly rotten, and incorpo-

incorporated with the Earth, then set the bud even with the ground, but bury it not. Set the Plants about half a yard distance, and top them at the third leaf to thicken those that grow below, thus taking off the button before it flowers at the third leaf from the top, unless you intend your stalk for seed.

Let the place into which they are transplanted, be under a South-wall, or otherwise with hedges, or fences of Reed, be defended from sharp weather.

When you gather your Plants for Use, tye two Plants together, and hang them in a shadowy place upon lines, but place them not too thick upon the lines, least they fruck, as the Planters call it, that is, grow mouldy upon the lines.

Woad. Woad, according to Mr. *Bliths* directions, is best sowed where you sow Barly or Oates, upon that very husbandry or tilth, about the middle of *March*, and may grow up among the Corn; because it groweth not fast the first Summer, but after the Corn is cut, it must be preserved; it requires a rich and warm soil. This Plant is of great use to Dyers, and coloureth the bright yellow, or lemon colour; It abates the strength and superrichness of land, and may prepare for Corn in land of its own Nature too rich, which is sometimes a fault, though not so frequently as the contrary extream.

Beans require a low deep ground and wa-

terish,

teriſh, not dry, ſandy or gravelly ſoyle: This is true of field or horſe Beans, though I firſt took notice of the great difference in our *London* Gardens, where the Labourers, for their own eating, would give one part in three more for a meaſure of Beans from the former, than from the latter ſoyl, who aſſured me that from the ſame ſeed and care, garden beans have much more meal, pulpe, or kernel, and thinner skins in the moiſt, than in the dryer and leſs wateriſh ground.

Num. 4. *The General obſervation for the manner of ſowing.*

Beſides the Examples aforeſaid, I ſhall add ſome Rules, ſuch as by Gardiners are uſually obſerved.

This is general, that all ſeeds muſt be covered with the Earth, which is done, either by ſowing the ground, and turning the ſeed in under the furrow, or by drawing trenches in the ſoil, and then drawing the Earth over them with a hoe, or ſowing the beds ready dreſt, and hacking in the ſeed with the ſame inſtrument, or by harrowing, raking with a rake, or drawing buſhes over the ſowed ground to cover the ſeed, or to ſet the ſingle ſeeds with a ſtick, or laſtly, to ſow the ground and afterwards to ſift or ſtrew fine mould thereon.

The two laſt wayes are for choice ſeed, when

when the workman desires to loose none for want of burying: The sowing under furrow is for such seeds as must endure the winter, the depth of ground being part of their security against the winter colds: nor are all seeds of strength to shoot their germen through so much earth. The sowing in trenches is used for Pease, there being thereby spaces left between the rowes, of half a yard, more or less, to gather them as they ripen, and room whence to draw mould to the roots, which frequently done, is very advantageous to them. It is likewise handsome for Spinach, Endive, Thyme, Savory, or other garden herbs, to grow in rows after this manner of sowing.

Moisture is absolutely necessary for the growth of all Plants, two or three dayes after a great rain is accounted a good season; in dry weather two days after rain, say the *London* Gardiners, agreable to that of *Ferrarius*, *Nec tamen simulac magnis imbribus terra permaduit, seres, sed tantisper expectabis, dum pluvius ille mador modice exsiccetur, ne madenti limosoque in solo statutæ radices exputrescant*, de Fl. cult. l. 3. c. 1. Seeds that are apt to run to a Muscilage, are unfit to endure moisture upon that account, as else where I noted.

I prescribe nothing concerning the observation of the faces of the Moon; For though the Moon hath greater influence upon all terrestrial bodies, then any other Planet, except the

the Sun, yet I cannot think that it is much Material under what *Phasis* of the Moon the Gardiner either Sows or Plants. Neither do Gardiners that work, nor Authors that write, prescribe alike rules; but contradict each other in their directions, for the particular observation of this Planet, as to any intended production. Nor is it agreeable to my reason, that the Moons being in the full at the first explication of the two dissimilar leaves, or germination of the Plant, should cause a double flower: This germination, according to this present History, differing little from other augmentations of the same Plant, in opposite quarters immediately ensuing: so that if a full Moon be proper, I see no reason why it may not be effectual, by vertue of the same phasis, the third, as the first, or the twelfth, as the sixth day of the seedlings augmentation.

The meliorating of ground belongs to the head of Improvement; here I shall only observe that where ground is very light, as in some *London* and *Kentish* Gardens, it is found profitable after sowing, to tread in the seed.

Some steep all Garden seed before they sow them to make the germination more speedy, but seeing there be no better wayes of infusion than in Earth and Water, why the same bosome of a well watered ground should not be most fit for this operation I see not.

In seeds that are long in coming up, the seed bed is not to be digged up the first winter: For I know divers seeds that will for a great part of them lye under ground the first year, and come up the second: of this Nature is the Ash-key sometimes, the Peach, Malecotone and some Plums.

Num. 5. *Of variety of kinds, different in colour, taste, smell, and other sensible qualities, proceeding from some seeds, and what Plants they are that bring seeds yeilding such variety.*

In the knowledge of what is proper to be taught, under this head lyeth one of the chief Mysteries of the Gardiner, and in the practise of it lyeth his chief gain. And therefore least I should be thought worthy to suffer for reveling of their secrets, I shall in my own defence, while I open their Art in matters of greatest moment, cite the Publishers too. I will begin with Carnations. In them you have seeds that give admirable Variety from the Orange-tawny Carnation, and all his stript kinds that are double, and keep their tawny in them in any measure. The white, Tawny, and Carnations darkly spotted, *Ferrarius* commends for producing variety of colours and stripes. Kernels of divers Apples and Pears, bring variety of kinds, different in taste, smell, colour, and hardness, and are as often promoted to better, as they degenerate to worst, as

I am

I am very credibly informed, by persons that profess themselves to have seen the experience. The kernels of the Bergamot Pear have brought a notable alteration, and produced a Pear far beyond that excellent kind: Peaches and Malecotones do ordinarily the like, so that by seed is thought to be their best propagation.

Our Gardiners in choosing the seed of stock-Gylliflowers, to make them bring double stocks, take their seed from such tops as bring five leaves in their flower, especially if there be one strip't; but Mr. *P.* sayes, those that bear double seeds, cannot be distinguished from the other, and I have reason to believe him, for such as chuse their seed this way do not find that it answers their expectation.

For Tulips that are early, or Præcoces, the purple (sayes Mr. *Parkinson*) I have found to be the best, next thereto is the Purple with white edges, and so likewise the red, with yellow edges; but each of them will bring most of their own colours. For the Media's take those colours that are light, rather white then yellow, and purple then red. Yea white, not yellow, purple, not red: but these again to be spotted is the best, and the more the better: But withal, or above all, in these respect the bottome of the flower, (which in the precox Tulipa you cannot, because you shall find no other ground in them but yellow) for if the flower be white or whitish,

ſpotted, or edged and ſtraked, and the bottome blew or purple, (which is found in the Holias, and in the Cloath of Silver) this is beyond all other the moſt excellent, and out of queſtion the choiceſt of an hundred, to beget the greateſt and moſt pleaſant variety, and rarity, and ſo in degree the meaner in beauty you ſow, the leſſer ſhall your pleaſure in varieties be: Beſtow not your time in ſowing red or yellow Tulipa-ſeed, or the divers mixtures of them, they will (as I have found by experience) ſeldome be worth your pains. The Serotina being not beautiful, brings forth no ſpecial variety: *Ferrarius lib.* 3. *cap.* 7. commends the Serotina for ſeed, (but I find he mentions but two ſorts in that Chapter, Præcoces and Serotine's) and among them the white, with the black purple, or blew bottomes or Scarlet, with sky-coloured bottome inclining to purple; for both of them will (ſayes he) bring Tulips mark't with variety and handſomneſs: But Tulips without a blackiſh bottome are no good breeders of various coloured flowers.

Variety in Tulips (ſaith Mr. *Rea*) is affected chiefly by ſowing the ſeeds of ſome choice flowers, as alſo by the changing of Off-ſets, and the ſecret working of Nature upon divers ſelf-colours.

For ſeeds you muſt be ſure to make choice of ſuch flowers as have ſtrong ſtalks, and the ſeed veſſel three ſquare of ſuch kinds as are moſt

moſt conſtantly well marked, and ſuch as have the bottomes and Tamis either blew or purple, which is rarely to be found in the Præcoces, whoſe bottomes are commonly white or yellow; yet there is one excellent kind that goeth by the name of the *Omen*, that aptly marketh with 3 colours, and hath the bottom and *Tamis* both blew, from the ſeeds whereof, doubtleſs many fine varieties may be raiſed; Next unto this the *Florizante*, *Morillion*, *Cramoſine*, *Periſhot*, *Admiral Encuſens*, and the reſt of the well marked Præcoces are not without hope, but from the Vice-Roy, and the varieties of Edgers few better then the Originals are to be expected.

The Media's or middle-flowring Tulips afford many more excellent varieties fit for this purpoſe, as the Adoratea of Holland, Carthago, Paragon, Jeron, Doctor Bolſon, Paragon Floriſon, Royal Tudart, Orient Virgin, Diana, Angelica, Cedanella, Princeſs Turgiana, all the Brabaſons, blew Anvers, and divers others; All theſe named, being well marked flowers of different colours, with blew or purple bottoms and Tamis, not apt to run, but abiding conſtant to the laſt; and therefore all flowers of hope, and ſuch as few Lovers and Collectors of Flowers are without.

And although probably many fine flowers may be raiſed from the ſeeds of thoſe well-marked flowers before mentioned; yet ſuch

as have a good collection of Modes, or self-colours, observing what colours are apteſt to change, and by the bottoms running up into the leaves, become well marked with ſeveral colours, doubtleſs by ſowing the ſeeds of ſuch, the product may be anſwerable to expectation; and though they come at firſt wholly of one colour, yet if that be either Orenge, Brimſton, Hair, Dove, Gredeline, Iſabella, Shamway, or any other light or ſtrange colour, they are to be eſteemed, for in a year or two, many ſuch have changed into good marked flowers, and ſo with all their increaſe continued.

To haſten which effect, let ſuch of your colours as are ſtrong and luxuriant, be ſet in lean and hungry, but freſh ground, and the next year after in that which is fat, and well manured; and ſo yearly removed to contrary ſoiles, until you obtain the end deſired; and ſuch flowers may be ſet in your Garden, and the reſt continued. The like courſe is held with off-ſets, to cauſe them to alter from the Original, as many have done, for the General Bole came from the Brown Anvers, the Cedanella from the Zeablom, and many fine flowers from the Brabaſon, Turloon and Widows.

The two leſſer Spaniſh baſtard Daffodills, the leaves of which are of a whitiſh green colour, one a little broader then the other, and the flowers pure white, bending down their heads, that they almoſt touch the ſtalk again,

again, give seed from which springs much variety, few or none keeping either colour or height with their mother Plant.

The seeds of divers *Sowbreads*, by name the *Roman Sowbreads with round leaves*, the *Autumnal Ivy leaved Sowbread*, some *flowers-de-lis*, and many sorts of *Bears-ears*, and *Armenia's* also, and *Stock-gilliflowers*, do the like in producing admirable variety.

As for Anemones, take it from Mr. P. and our common daily experience, that there is not so great variety of double Flowers raised from the seeds of thin leav'd Anemones, as from the broad leaved ones. Of the Latifolias, the double Orange-tawny seed being sowen, yeildeth pretty varieties, but the purples, or reds, or crimsons, yeild small varieties, but such as draw neareſt to their original, although some be a little deeper or lighter then others: But the light colour are they that are chief for choice, as white, ash-colour, blush, or Carnation, light Orange, Simple, or party-coloured, single (or double if they bear seed) which must be carefully gathered, and that not before it be fully ripe, which you shall know by the head, for when the seed with the woollineſs beginneth a little to rise of it self at the lower end, then must it be quickly gathered, leſt the wind carry it all away, after it is thus carefully gather'd, it must be laid to dry for a week or more, which then being gently rubbed with a little dry

sand, or earth will cause the seed to be better separated, though not throughly, from the woolliness or down that compasseth it.

In the seed of the Mervail-of-the-world, take notice, that if you would have variable Flowers, you must chuse out such Flowers as be variable while they blow, that you may have their seed! for in this Plant if the Flower be of a single colour, the seed will likely bring the same.

Num. 6. *Some other relations of Transmutation, and the possibility of a change of one species into another examined.*

I have often heard persons affirm, that they have sowed Barley, or some other grain, and in the ground the seed hath been so altered, as to send forth Oates instead of Corn, according to its own species. I am as yet far from giving any assent to this their History. The reasons why I disbelieve them are, first, because the Relators affirm whole fields to be thus varied, and that to another species, *viz.* Oates, which is different from Barly in the straw, ear and grain it self. Whereas in the variation of seed, in those vegetables, in which the change is undoubted, the colour only of some other easily alterable accidents (such as the sensible qualities are generally found) are transmuted: And this transmutation ends not at all in another divers kind; but

but in several small diversities of the same kind. The stories of Wheat turned to Mustard-seed were as likely to be true, and is a fit parallel to create a right belief of the true cause of the mentioned effect. Secondly, I knew a Gentleman who plowed a piece of land in the Spring, and then sowed it not, but after it was harrowed, and prepared for seed, left it to its own Genius and Nature to produce what it was inclined to: The Ground was of its own Nature apt to bring forth wild-Oates amidst the Corn, now in defect of Corn there grew as many wild-Oates unmixt from any other weeds, as the land could carry. This was tried in a great peice of land, and much profit was made of the Oates, the Gentleman having cut them green for Fodder, *Anno* 1657.

My opinion therefore is, That the fallacy which befel my abovenamed Relators was, that they mistook the cause of the production of the Oates mentioned; for to me it is much more easie to conceive, that by some evil accident, as it often happens (the Seed-corn being corrupted and perish'd in the ground) the ground its self from its own Seminary, sent out the suppositious Crop of Oates or Mustard, than that there should be a variety of so strange a Nature, and declension from its property, in the issue of any species.

A *Digres-*

A Digression concerning the possibility of the Transmutation of Species.

It is indeed grown to be a great question, whether the Transmution of a species be possible either in the Vegetable, Animal, or Mineral kingdome. For the possibility of it in the Vegetable: I have heard Mr. *Bobart* and his *Son* often report it, and proffer to make Oath that the *Crocus* and *Gladiolus*, as likewise the *Leucoium*, and *Hyacinths* by a long standing without replanting have in his garden changed from one kind to the other, *viz.* the Saffron-flowers into the Gladioli: and for satisfaction about the curiosity in the presence of Mr. *Boyle*, I took up some bulbs of the very numerical roots whereof the relation was made, though the alteration was perfected before, where we saw the divers bulbs growing as it were on the same stool, close together, but no bulb half of the one kind, and the other half of the other: But the change time being past, it was reason we should believe the report of good artists in matters of their own faculty.

Mr. *Wrench*, a skilfull, and industrious gardiner for fruit, and kitching-plants, told me, that the last year there was a change betwixt the kinds of the Cole-flower, and the Cabbage. Others I know, who as from their experience, most confidently affirm, that they have

have Prime-roſes of the milk white colour, the root whereof before in another ground bare Oxelips. In the kind of purple Primroſes I have taken up roots whereof the one half hath at the ſame time born one or more Oxelips, and divers Primroſes together with them. The Primeroſe was the ſmalleſt ſort of the purple colour; the difference of the Flowers this, that the Oxelip came up with an exceeding full ſtalk, and many ſmall flowers thereon, the part of the root that bare Primeroſes, ſent out many ſmall ſtalks very much inferiour to that of the Oxelip, with Flowers like thoſe born by the Oxelip. The firſt that I ſaw of this kind, were in that excellent Chirurgion Mr. *Day*'s garden, where I was informed that they were deriv'd originally from pure ſimple Primeroſes, but ſince I have obſerv'd them in divers other places. But this is not great nor hard to be made by Nature, for the ſap running up plentifully within the ſame coat; two or three ſtalkes riſe within the ſame coat, and the ſeveral flowers ſpringing out at the top muſt appear in the form of an Oxelip; which has a ſtalke ſo much bigger than a Primroſe ſtalke, by how much it has more flowers: for a Primroſe ſtalk is very ſlender, and that very great. In Sicamores, Willows, and Aſh-trees, it is not unfrequently ſeen that two or three branches by the luxuriancy of the ſap, do in like manner run up united into one bough, where-

whereby its roundnes and shape receive a very pretty alteration. And it is usually believed that divers single flowers may be changed into double by frequent transplantations, made into better grounds. I knew those that have had the wood Anemonies, and Colchcums double, who affirm that they took them into their garden wild, and single, and that that change was made by the soyle, and culture of the place.

For the animal Kingdome, the instances of transmutation are in silk-worms, cadix, and all caterpillars, which after a long sleep from the reptile, turn into the volatile kind.

The mineral Kingdome is supposed to be famous and fruitful in these changes, the hope of the Philosophers stone, or perfecting medicine requiring this belief: Yet I am perswaded that in many of their changes they rather separate, and bring to apparence a latent mineral, than produce it by the transmutation of another into that nature. *Sennertus* recants those writings of his, that affirmed Iron to have been turned into Copper by natural and artificial waters of Vitriol. The effects only in his second, and more mature judgment, being the separation of a Copper before latent in the Vitriol, and the precipitation of it by the parts of the Iron: and I have seen some experiments made by the honourable Person, for whom I am now writing, that have added strength to my former perswasion,

swasion, particularly the supposed transmutation of quicksilver into lead, published as real by the learned *Untzerus* and others, and to be made by dissolving the quicksilver in *Aqua fortis*, and precipitating it by the tincture of Minium, proved but sophistical, the Lead produced that way being indeed not made of the Mercury, but only reduced out of the tincture of Minium, wherein it lurkt, as that Gentleman doth more circumstantially set down in his own papers. The process that he cites out of *Untzerus* is this, Take, says he, ashes of Lead, or Litharge, or Minium, poure on it phlegme of Vinagre, and macerate it therein for a night, then dissolve Quicksilver in *Aqua fortis*, and into this solution let fall some drops of the forementioned Vineger, and immediately there will precipitate to the bottome a pouder which reduced in the fire to a Metal, will turn into Lead. And others there are of the like nature, which it were not proper here further to insist on.

It is a question, whether there be any real transmutation, from the Vegetable, to the Mineral kingdome, in petrifaction of any sort of wood, Those petrifactions, which I have seen in *England*, are made thus, some particles of stone, that impregnate the body of water, make a crust about the stick that is to be petrified, and enter into the pores thereof, as fast as they are layed open by the water, washing through the stick, wherein there interceeds,

ceeds, no change of the same parts, but by addition of some, and subtraction of others, if I perceive aright the new effect is wrought. The proof whereof may be, that the fibres of wood appear visible, and to the touch and taste amidst the body of the stone.

In *Ireland* there is a Lake, wherein (as that Noble Person I but now mentioned, hath related to me) there is so great a petrifying faculty that the best whetstones used in that nation, are made of wood, cast therein to be petrified. In which stones, though all the lineaments of the woody fibres remain, yet they are indued with the hardness, and other qualities of an exact stone. And Coral, the entire stonyness whereof no man can doubt, may well be imagined to be originally a vegetable bearing root, stalk, and leaf; and that afterward it is turned into its hardness by the peculiar property of the water: whether these operat ons of nature are likewise perfected by addition and subtraction of parts only, or whether it be required that some parts for the production of this effect be transmuted, I shall not determine.

And for the deciding the whole question, if the form be specifical, and so made by the aggregation of a certain number of accidents; those accidents and that number must be assigned that are thought enough to compleat a new form, before we may begin to judge in this matter. For that very many accidents may

may be changed, it appears by the above-named instances in Vegetables, and in other bodies many more: Vineger and Wine, are the same parts transposed, and yet there seems to be more difference between them, than between Endive and Cichory, Maiden-hair and Scolopendrium, Rubarb and Dockes, which are in Vegetables esteemed for divers species, formally or specifically distinguished.

Num. 7. *Of Provision for Seed.*

Many Roots are to be transplanted at the latter end of the year, and will bring forth perfect seeds: as Carrets, Parsneps, Turneps. Cabbages are to be laid in Cellars all Winter, the root and Cabbage being replanted in the spring, which is esteemed the best, as it is the most chargeable way of procuring seed; or the seed may be got, though not in so plentifull a manner, from the stalks of Cabbages, whence in the season the Cabbage was taken; those stalks being either replanted or standing in their old places: Those that intend to provide their seed this way, had best cut off their Cabbages as near the head as they can, and to cut the stalk slopewise upward, and not directly cross the stalk that so rain may run off, and not rot the stalk whereon the seed is to be born; Coleflowers give their seed from the like care that is bestowed on the Cabbage.

I have

I have seen Gardiners that provide Cabbage-seed in great quantity for the shops in *London* upon their course ground, to sow Cabbage-seed, which without transplantation shall bring forth Coleworts for boyling herbs and then a crop of seed: many Plants that bear fruit, bring their seed every year in their fruits, so Apples, Pears, Plums, Peaches, Aprecots, Wheat, Barly, Rye, Pease, Beans, and many that bear no fruit do the like, so Lettuce, Radish, all grasses, so that unless some peculiar Plants which require to be excepted. (For Yucca Indica, bears neither flower nor seed in less than four years time) 'tis general that each seed will ripen every year, and the best general token of maturity is its loosness from the pedal, by which it is joyned to the stock, so as kernells in ripe Apples grow loose from the core.

Those persons that make Verjuce or Cider can best furnish him that intends a Nursery, for notwithstanding both the violence of Mill or Press, the kernels escape entire enough for Vegetation; but care must be had that they be immediately sowen after the pressing, lest being laid on a heap they heat, in the manner of wet Hay, and burn the germen of the seed, which in the moisture of the bruised fruit by that heat, will prematurely sprout forth to its own perishing.

In providing Lettuce-seed, mark the Plants that you see strongest for seed, and after they have

have begun to shoot stalks, strip away the lowest leaves, two or three hands breadth above the ground, that by them the stalk be not rotted.

Let Carnation and Gillyflower-Cods of seed stand upon the Root so long as you may, for danger of frost, then cut the stems off with the Cods on them, and dry them so, as not to loose the seeds; The dryness of the Cods, and blackness of the Seed, is an Argument of ripeness: *Ferrarius lib.* 3. *cap.* 15. Reports, that the bottome of every Cod brings the best seed: and the largest flowers.

Another rule for Carnations is, That if you would have good seed, you must not suffer above five or six flowers to be upon a stalk, and these must be the top flowers at the first flowering, for those that come single are generally the heads of the under slips.

The seed of Crocus's are only, or at least, best taken from the ordinary strip't vernal Crocus, the great purple Crocus, the great blew Crocus of Naples, the stript purple, the less purple, flame coloured, the purple with small leaves, the yellow stript, the cloath of Gold.

Clover-grass and seeds of that nature, are provided by letting the grass run timely to seed, particularly by mowing it about *May*, and thence abstaining till the seed is through ripe.

Such seeds as are weighty, and sink in wa-

ter are best; the contrary are usually languid and unfit for propagation.

Out-landish seeds are used for such Plants, whose seeds cannot be got here for want of Maturity, or any other reason.

The Spanish-Musk-Melon-seed is accounted best, though we use our own with good success: few Gardiners here will use their own Onion-seed, for they find it runs to Scallions: Myrtle with us comes not to seed. For the sensitive plant, the Amaracoc or Passion flower, &c. we send for seed to the Barbado's.

What advantage our Nation might have by propagation of exotique plants by seed, brought new from several Countries beyond the Seas, it is hard to guess; that there would be advantage it is certain. I remember that *Bellonius* a man very diligent, and much employed about knowing the nature of Plants, growing in other Countries than his own, which was *France*, wrote a whole book to shew the possibility and advantage of this improvement, to perswade Merchants to furnish Gentlemen with seed, and them to use it. 'Tis known that Peaches, Aprecots, Nectarins, were lately not only strangers to *England*, but to *France* likewise. Mulbery is likewise an Exotique plant, and by King *James* his Command sent for over and propagated by seed.

Exotique seeds are good not only to propagate Plants, yet not with us, but likewise

to

to make a more plentiful production then can with ease be made from any other way of propagation of such we already have.

Care must be had in sowing seed, or at least in setting them, where you intend that they shall thrive, that the ground bear the best proportion may be to the places and particular Minera of the places where such plants in other parts use to grow, not to put mountainous plants in low and moist grounds. Why the Taurick Cedars, were they planted in *Wales*, should not grow, I know noe reason.

It were worth the while to consider in all seeds, whether there be no distinguishable difference in the seed, that may be of use, as to sooner or greater growth. In the same bed divers seeds being sowed of one kind, particularly Apples, Pears, Plums, Cherries, or Peaches, some Apple-seedlings will in the same mould and distances, much out-shoot the rest of the same kind, and so in the Pears, and other kernels: it might here be enquired, whether the great or less send bigger Plants, and of speedier growth? as it is by some observed in buds, that the fairer the bud is upon the sheild, and stronger, the better thrives the inoculation, and not only grows more certainly, but more lustily.

2. Whether the Canker in pippins, arise not from an incongruous grafting, and it were not better to bring them up from ker-

nels, or graft them on a more mild ſtock than that of a Crab.

Whether there might not be gotten divers years ſooner trees of ſtature from kernels of great bodied, and quick growing Apple trees, and ſuch whoſe kernels vary not much their kinds, than from Crabs, which is a wood of a ſlow growth and harſh Nature.

Num. 8. *The manner of growing by Seed.*

The ſeed is conſidered either as already made, or as it is under the hands of Nature, imperfect, yet in the way to be made.

In it made, there are conſiderable, firſt the Coates and Cotton that cover it about, and preſerve it from injuries; ſecondly, the eſſential and proper parts of the ſeed it ſelf.

Many ſeeds have two Coates above the Cotton, and one thin one under, next inveſting the ſeed, ſuch are Sicamores.

All ſeeds that I know have within their Covers actually a Neb, which anſwers to a root, which is joyned to leaves more or leſs in number: betwixt the ſtalks of (or amidſt) theſe leaves there is a bud, eye or Germen, juſt oppoſite to the Neb, or initial Root, but by reaſon of its ſmallneſs it is ſcarce diſcernable in many ſeeds till it begins to ſpring.

1. Moſt Plants have only two leaves actually joyned to the Neb, which are commonly very unlike the proper leaves of the Plant; of

of this sort are the flowers of the Sun, Ediſſarum Clypeatum, Cucumbers, Melons, Amaranthus, Thiſtles, Thlaſpies, Mallows of divers kinds, Arch-angels, Spurges, Nettles, Clary, Orach, Dill, Parſely hath two leaves diſſimilar, but not much ſo, Melilot two diſſimilar, and one, if I miſtake not, ſimilar.

2. Many Plants have more Leaves in their ariſing from the Neb, as Creſſes have ſix.

3. Some Plants have but one diſſimilar leaf, as Anemonies, Tulips, Fritellaries, and all bulbous ſpring flowers that I have obſerved. Wheat, Barly, Rye, all grain and graſſes that I know have a germen wrapped up at one end of the grain in a hoſe or ſheath, which germen conſiſts of leaves wrapped about the bud by a plica or folding made the long way of the leaf, not overthwart as in Sicamores, Maples, and other complicated leaves of ſeeds. Nor doth the whole corn divide it ſelf into leaves, and coats or husk, as in thoſe examples, but the greater part thereof contains a meal, which by the heat and moiſture of the ſoyl is turned into a pappy ſubſtance not unlike the Chyle found in the lacteals of animal bodies, and may be, as I ſuppoſe, repoſed nouriſhment for the young blade at ſuch a time as the Earth would prove but a dry Nurſe. I have taken notice that Carnations come up ſometimes with three, ſometimes with four leaves, though the moſt have but two: and it is *Mr. Lobarts* obſervation, that

such as come up with more leaves than two, provide double flowers, which if it generally holds true, it were a compendious way to weed out all the rest at the first coming up, to avoid the labour of culture of such Plants as in the end will not prove advantageous for profit or pleasure.

Beans, Pease, Kidney-beans, Lupines, have this peculiarity, that the grain being cleft, each half is as one of these dissimular leaves, which is usually contained in every seed, and between these thick leaves are contained other similar leaves, or such as differ but in growth or bigness from the true leaves of the Plant. 'Tis to be observ'd in all these great seeds, that though the pulse, or thick part of the grain perish, yet if the Neb and small leaves are entire, the seed may prosper; as I have seen Field-beans that have been eaten through with worms, prove good thriving seed. But 'tis reported, that Pismires have learned the wit to spoyl the seed from growing in their store-houses, by biting off the very Neb before they repose the grain. I confesse I could never find any of their store-houses to learn the Truth of this, and divers other observations, which makes me question, whether ours be the same kind of Ant which is mention'd by King *Solomon* as so diligent and foreseeing a proveditour.

The growth of the Plant from the seed is thus; by convenient moysture and heat, the Neb

Neb ſtricks through the Covers, and goes directly down, if not impeded, in earth or water, a convenient way, ordinarily, two or three inches, in which time the leaves either rowled up, or otherwiſe incloſed, break their bonds, and explicate themſelves, being lifted commonly a little higher by the growth of the ſtalk, or lengthned Neb; and you may obſerve, that the growth above ground, at the firſt motion upward, is nothing proportionable to the motion downwards. The truth is the Hypotheſis of Sir *Kenelme Digby* in his Diſcourſe of the Vegetation of Plants, p. 18. 19. ſeems to contradict this, where he tells the Royal Aſſembly he ſpake to, That *as to the bean, although the ſwelling and burſting forth of the fiery and Viſcoſe parts of it, be towards all ſides, according to the Nature of fire which ſtreameth out from the Center every way to the Circumference, yet it will be efficacious upwards towards the Aire, becauſe it meeteth with leſs reſiſtance that way, then any other; For downwards the Earth lyeth more compacted then it doth over the grain, &c.* His concluſion therefore in the next page is this: *Upwards then, and towards the Air muſt be the ſpeedieſt and greateſt concourſe of theſe hot and viſcous ſtreams, which coming into the Air, contract themſelves into a circular ſtalk.* I can only ſay in all my Experience, though I am loath a perſon ſo excellently learned ſhould be found miſtaken in any circumſtance) That a Bean, or any other ſeed that I know, being laid

(ſuppoſe) half an inch under the ſurface of the Earth, will at its growth ſtrike a root two inches downward to one inch it goes upward, 'Tis indeed more likely it ſhould ſtert its ſtalk the more eaſie way through the yielding Air, but more uſeful that it ſhould ſtrike downward for the more firm rooting of the Plant, and the proviſion of a receptacle of juice for the life and growth of all the ſuperſtructure. And this more uſeful courſe has been, and is the way of Nature in the Bean it ſelf, and other Plants, inſomuch as they have fallen under my obſervation. After the root is well made and faſtned betwixt the leaves that were actually contained in the ſeed, then and not before, there ariſes into more plain ſight and appearance, that little Germen before, in many places ſcarce ſeen, like to that bud, which is left on Plants in winter, which ſpringing, brings forth the true leaves and branch of the Plant ſowen.

If I am enquired of, whether each ſeed has a compleat eſſence and diſtinct form of its own. Nay further, whether it be a true and perfect Plant? I muſt ſay that I have found it ſo to be, even more than an egge, a living thing, and immediately nouriſhable; It has root to grow, body to bear the port of the Plant, Bark to direct the Sap into all its parts, and germen or bud to ſecure the means of future growth, and to ſhoot leaves, which is all and ſomewhat more than in the winter, the ſturdieſt Oke can boaſt of. It

It has been accounted an Intereſt in Philoſophy heretofore, and that in our Schools, that ſeed ſhould not be eſteemed an actual and formal plant, becauſe of divers abſurdities, that if ſeed were animal, would happen in their School doctrine; as that there would be pluralities of formes in the ſame trees; The Soul might be diviſible into parts; The ſame thing might be agent and patient; Nay ſome have ſaid, that it might be of dangerous conſequence in Divinity, if it were granted, that ſeeds had the actual forms and eſſence of that thing whoſe ſeeds they were.

But this I am ſure of, that Truth can have no bad conſequence, and am content that it is no Hereſie now to appeal to ſenſe from a Doctors opinion, and that I may freely in this matter require to be tryed by my Garden, though it be againſt the ſentence and judgement of the Doctors of *Conimbra*, *Suarez*, *Ruvio*, *Pererius*, *Bonamicus*, *Fonſeca*; and that we begin to lay aſide the fear that from a certain truth, ill conſequences may ariſe: That Canon will certainly hold longeſt which is beſt built in the bottome.

It is conceived by ſome, that the immediate cauſe of the growth of the ſeed, is the Spirit working upon the Salt and Sulphur, Earth and other conſtituent parts or Elements of the Seed: For the Spirit is ſuppoſed to be made Volatile by the heat of the earth and water, which in Spring and Autumne, (the chief

cheif times of germination) is of a proper temperature for fermentation; and then the ſpirit being ſo Volatized, and riſing up and expanding it ſelf every way augments the whole Plant, and diſtends the ſides of the ſeed, whereby the growth of the Seed-plant is effected.

But how it comes to paſs, that the conveyance of theſe expanded particles is ordered to proceed, according to the lineaments of each Vegetable, no perſon to my knowledge who offers only at the Hiſtory of the propagation of Vegetables, has yet made any conceit; and it being beyond any ocular diſcovery of the moſt accute Searchers, to find out the Conduits or Truncks ſerving to ſo intricate a carriage, and how it comes to paſs, that a ſeed firſt, hath its Neb thruſt down without dilatation of the ſides, and then, how the upper part of the Neb or germen orderly frames the Vegetable above ground in ſo trim a body, rather then a confuſed maſs, neither can nor do I take it for any part of my taske to declare.

I may poſſibly by ſome be thought ſevere in judging that the cauſes of theſe appearances have not been yet reſolv'd. But it is *Solomons* ſpeech, *Eccleſ.* 1. That which is wanting cannot be numbred. I confeſs that for all the cauſes and wayes of production, explain'd either by Sir *Kenelm*, or other our Noble wits, I ſee no reaſon but why even by granting

granting the Sun, and all the Elements, to have the operations ſuppoſed by them, Their Oak might bear Pippins as well as Acorns, why an Acorn might not produce a Tree with leaves like a Cabbage as well as thoſe proper to the Oak. For thoſe general cauſes they are wont to alledge, ſeem not to me, nor to any reaſonable man, ſufficient to produce the particular ſpecifications of ſo many thouſand Plants, that in all grounds and Climates, continue in and keep their Natures, and to produce their own kind without any notable alteration; the Sun may diſtend or dilate the ſhuits, or flowers, or leaves, by rarifying, and drawing plenty of juice, but if there be any other power beſide that particular and Specifick one that was given to every Plant at the firſt Creation, able to variegate the leaves, and flowers, and ſeeds, and barks, and woods of every Plant anſwerable to the vaſt variety there is in them; I confeſs it is a power that I never yet was ſo learned or ſo happy as to underſtand.

I ſhall likewiſe leave it to the imaginations of Philoſophers to determine, whether upon the diſtention made, it be by any elective faculty in the Seedlings, filled up with ſimilar parts drawn from the Earth, and ſo by nature originally fitted ſpecifically for that Plant: or whether there being a continual motion of particles from the earth, preſſing upon the Plant, thoſe only get entrance whoſe ſhapes and

and figures are such as correspond to the pores in the young Vegetable; which meeting in the body of the Plant, with its constituent parts in nature, not unlike themselves, they easily are joyned thereto, and so cause an augmentation in the whole: or whether dissimilar parts, either to fill up the Vacuum made by distention, or for other reasons, got up into the Plant, do obtain there a change of nature, and from the form, Soul, *Archeus*, or other principle, are altered from their first being, into a likeness of nature with the Seedlings, and become homogeneous to it; These are questions, in the determination of which, till I am better informed, I desire to take no side.

Num. 9. *Of the cause of Greenness in the leaves of Vegetables.*

It has been made a question by some, what it is that causes greenness in all Herbs, especially such whose seed, and the stalk, and leaf contained therein are white, and whether the cold beating of air and water upon Vegetables may not have some influence in the production of this effect.

I truly have been tempted to think the affirmative, which is that the coldness and briskness of the free aire, in Plants that grow in the land, and the like quality of the water, in water plants produces the verdure or greenness,

greenness, that is generally the beauteous Vestment of all Vegetables, or at the least has some considerable influence as to this production: for by experience I have proved that Plants being in a close room, brought up from seeds in pot, or otherwise, the leaves and stalks prove to be white, or pale, and not green, which is according to the Lord *Bacons* experiment, who *Cent.* 5. *Exp.* 47. setting a Standard Damask-Rose-Tree, &c. in an earthen pan of water, where bearing leaves in the Winter, in a chamber where no fire was, the leaves were found (as his Lordship relates) more pale and light coloured, then leaves use to be abroad; which paleness, I suppose to be greater or less, proportionably to the freshness and freeness of the aire that the plant enjoyes. Grass will likewise change its colour, if by any weighty body, or other lying upon it in the field, it be kept from the aire. The truth is, all Plants have peculiar delight in the aire, which I have proved by this Experiment; I have taken young seedlings in a pot, and put them in a window where there was a quarry out, the seedlings would immediately leave its upright growth, and direct its body straight to the hole, and so become almost flat and level with the earth in the pot: Then turning the pot so, that the inclination of the stalke might be from the hole, the Plant has then crook't it self in form of a horn, or the letter C. to the

aire

aire again. Upon the second turn of the pot, the upper horn being placed from the aire, the Plant would, with its upper part, return to the open place, and leave the stalk now in the form of an S. Nay, sometimes I have bid persons tell me, which way they would have such a Plant grow; they have marked the place in the brime of the Pot, that mark I have turned to the hole in the window, by which means the Plant without any force, and that in not many hours space, hath inclined its stalks to the mark made.

That the aire has great influence in producing the verdure of Plants, may likewise not improbably be argued from the Experiment of Blanching, or whiting the leaves of Artichockes, Endive, Mirrhis, Cichory, Alexanders, and other Plants; which is done by keeping of them warm, without the approach or sentiment of the cool and fresh aire; whereby all Plants that otherwise would bear a green colour, become exactly white.

Hence it may likewise be, that the roots of most Vegetables that are under ground, and covered from the aire, are white generally, whereas the stem, and upper parts of them are ordinarily green, and many roots that are by nature of a peculiar colour, as Radishes yet the point of the root that is deepest in the ground, retains a whiteness, as well as other roots, being in that part of the root removed from the aire, the red part commonly standing

ſtanding above or juſt in the ſurface of the earth.

Hence alſo it may be, that thoſe leaves of Cabbages and Lettuce that are expanded in the free aire are green, thoſe that being covered with their fellows, and ſecluded from the blaſts of wind and weather, and kept in a warm Covert, become as white as any thing that is artificially blanch't.

True it is, that there be Plants that grow in the bottome of waters, and ſo cannot be ſuppoſed to have this help from the aire, otherwiſe than as the aire chills the water, and the water having received this quality from the aire, makes the like impreſſion upon its domeſtique Plants.

CHAP.

CHAP. II.

Of Propagation by Off-sets.

Of this way *Virgil Georg.* 2.

Pullulat ab radice aliis denſiſſima ſylva,
Ut Ceraſis Ulmiſque ; etiam Parnaſſia Laurus
Parva ſub ingenti matris ſe ſubjicit Umbra.

In mighty Groves ſome ſpring from their own root,
So Cherries, Elms, Parnaſſian *laurel, ſhoot,*
Which ſmall, in great ſhade of their Mother riſe.

Num. 1. A Catalogue of Plants which may be Propagated by Off-sets and Suckers ariſing with Roots from the ſtool and Root of the Mother-Plant.

Aconite or Woolfs-bane.
Adders-tongue.
Alexanders.
Anemones.
Angelica.
Ariſtolochia.
Artichockes.
Aſphodels.
Aſarum.
Aſparagus.
Avens.
Barberies.
Barrenworth.
Batchelors-buttons.
Bawme.
Bears-ears.
Water & wood *Betony.*
Biſtort.

Spaniſh

Spaniſh *Broome.*
Butchers Broome.
Brooklime.
Briony.
Burrs, and ſuch like Apples.
Bugloſs.
Burdock.
Burnet.
Calamus Aromaticus, which requires moiſture.
Camomill.
Caltha or *March-Marigold.*
Cherries where the ſtock is not grafted.
Chives.
Cinquefoyle.
Clownes all-heal.
Coſtmary.
Cowſlips.
Comfrey.
Cowſlips of Jeruſalem.
Colts-foot.
Columbines.
The *Crown* Imperial.
Crowfoot.
Cukowpints.
Dames-violet.
Dayſies.
Dens Leonis bulboſus.
Dittander.
Docks-tooth
Dockes.
Dorias his wound wort.
Dragons.
Dulcamara, or woody Night-ſhade.
Egrimony.
Elmes.
Elicampane.
Everlaſting *Vetch.*
Ewe.
Fernes.
Feverfew.
Figtrees.
Filbeards.
Filipendula.
Flowers-de-luce.
Fleuellen or *Speedwell.*
Fraxmellis.
Galingall.
Garliques.
Gentianella.
Germander.
Globe-flower.
Gooſeberries.
Golden-rod.
Ground-Ivy.
Haſel-nuts.
Harts-tongue.
Herba-paris.
Helleborine.

Hellebores.
Hercules all heal.
Hyacinths.
Horse-radish.
Houseleek.
Horse-mints.
Hops.
Horse-taile.
Jasmine.
Jerusalem Artichoke.
Kentish-Codlings.
Knapweed.
Lovage.
Ladies bed-straw.
Lilies.
Lilium Convallium.
Lunaria.
Lungwort.
Mandrakes, for often there may be taken from them particles of their roots, which will grow well, though the usuall way of their propagation is by seed.
Marshmallows.
Masterwort.
Madder.
Mints.
Moly.
Monks-hood.
Mulberries.
Mugwort.
Nurse-gardens.
All sorts of *Orchis*, or *Docks-stone.*
Petasitis.
Periwincle.
Peony.
Pease.
Pilewort.
Poplars.
Potatoes.
Prunella.
Primroses.
Pulsatillas.
Raspes.
Radix cava.
Reeds.
Roses of most kinds.
Ruscus, or Butchers broome.
Rubarbs.
Satyrions.
Saponoria.
Sanicle.
Scabious.
Sedum.
Serpillum.
Setfoyle.
Shallot.
Skirrets, though seeds will produce better.
Smallage.

Smallage.
Sorrels.
Solidago Saracenica.
Solomons Seal.
Some *Spurges.*
Stichwort.
Strawberries.
Sword-flags.
Tarragon.
Tansey.
Thistles.
All sorts of *Tulips.*
Valerians.
Some *Vetches.*
Vervaine.
Times.
Violets except the yellow.
Water-mints.
Water-lillies, and most of the other water Plants.
Winter-Cherries.
Willow-weeds.
Woolfsbane.
Wormwood.
Yarrow.

Some other roots may likewise be divided which send forth no natural off-sets, as the Cyclamens particularly, which being quartered, do not unusually recover the wounds made; and procure by the issuing of the sap, a new bark for their defence; but these methods being hazardous, because of rottenness incident to them after such divisions, few gardiners will change the certainty of one entire great root for the doubtful hope of this projected quadruple encrease: when otherwise they may in time have much greater from the seed, without any peril to the Mother-Root at all.

Num. 2. *The way of making Off-sets by Art.*

Nature usually provides this help of Propagation, without the wit or industry of men, called to her assistance, but that not generally in all Plants, nor alwayes in any one: and therefore I esteem it well deserving any mans learning who delighteth in Gardens, to know any means to enlarge this way of Propagation beyond the bounds it is carried to by natures course; There is a pretty way (which in truth I first learned from Mr. *Bobart* our Physique Gardiner) for the making Off-sets where nature never intended them; which is done by bareing the root of Plants of woody substance, and then making a cut of the same fashion with that which is made in laying: Into this cleft a stone must be put, or something that will make the root gape, then cover the root over three inches with mould, and the lip that is lifted up will sprout into branches, the root of the old tree nourishing it. When the branches are grown, cut off this Plant with its Root to live of its self.

If you can, leave an eye on the lip of your root, which you after the incision lift up; for the branches will then more speedily and certainly issue out of the root so cut.

In Bulbous Roots, *Ferrarius* makes off-sets thus: If (says he) a Bulbous root is barren of Off-sets:

Off-sets: either put it in better earth, or cut it upon the bottom, in the crown of the root whence the fibres spring, and that but lightly with your naile, and sprinkle some dry dust as a medicine to the wound; and the effect he affirms to be this, that so many wounds as you shall make, into so many off-sets shall the genital vertue dispose it self.

Num. 3. *Rules for direction in taking off Suckers, or Off-sets.*

Care must be had, that the Dame be not destroy'd in her delivery from her new brood, which may easily be done, if too great a wound be made upon the stool, or mother-plant, by tearing of the Suckers. 'Tis *Ferrarius* his peculiar precept about Anemones: That they be sure as to take off such Off-sets that will scarce hang on, so not to tear off such as hold fast to the Mother-plant, for that would be to the peril both of the Off-sets and Mother-plant. Yet I have seen the very substance of Sowbreads to have been divided with a knife through the heart, and yet grow well on either part, when they have not afterward been over glutted with wet. Flags, Bears-ears, Primroses and Cowslips, and generally all roots, that are not Bulbous or tuberous must have, and do require a violent separation, but the less the wound is, the

better shall your Plant thrive, and be less subject to corrupt by the moisture of the earth.

In the replantation there is required the general care of young sets, all Plants of fibrous roots are assured in their growth, by convenient watering, but for bulbous and tuberous the Gardiners hand is, and ought to be more sparing, because that moisture is a peculiar enemy to these Plants, and often rots them, if it get into any crany of their roots.

Num. 4. *Examples of Planting by Off-sets, of Hops, Licorice, Saffron, Skirrets.*

Hoppes, Licorice.

The Hop being one of the most useful Plants that are propagated by Suckers, or Off-sets, I shall begin with the Culture of it, And shall give my Planter such instructions for the whole Manage of this Noble Vegetable, as I have learn'd from the Observations of Planters that have made (I speak within compass) above 200 pounds in a year of an Acre of Hop ground, cultivated with the Expence of 10 pounds per Acre, as themselves have related it to me. I mean my Hop-Masters at *Farnham* in *Surry*, and thereabouts. And yet I intend not to derogate from the Instructions and Directions given by Mr. *Blith*, but where just reason, and the practice of the places where such observations have been made, shall necessitate me so to do.

Mr. *Blith*

Mr. *Blith* directs not amiss when he orders thus---- In *March* if you have not pulled down your hills, you should with your Hoe, as it were, undermine them round till you come to the principal root, and take the upper or younger Roots in your hand, and discerning where the new roots grow out of the old sets, of which be careful, but spare not the other; but in the first year uncover no more but the tops of the old sets, but cut no roots before the end of *March* or beginning of *April*. The first year of dressing, you must cut off all such as grew the year before within one inch of the same; and every year after cut them as close to the old roots; those that grow downward are not to be cut, they be those that grow outward which will incumber your garden, the difference between old and new easily appears; you will find your old sets not increased in length, but a little in bigness, and in few years all your sets will be grown into one; and by the colour also the main Root being red, the other white; but if this be not early done, then they will not be perceived: And if your sets be small, and placed in good ground, the hill well maintained, the new Roots will be greater then the old; if they grow to wilde Hops, the stalks will wax red, pluck them up and plant new in their places.

At *Farnham* they generally begin to Pole their Hops about the latter end of *March*,

sometimes sooner, sometimes later, according to the forwardness or backwardness of the Spring. In hilling and poling, this rule is generally observ'd, That if the Center or middle of your hills are five foot asunder, then three Poles will suffice each hill, otherwise if they stand nearer, two Poles may be sufficient. In some places they pole them before they make their hills, and in some places after: At *Farnham* they make their hills commonly when they cut and cleanse the Hop roots from the suckers, namely at the beginning of *March*, and Pole them in an ordinary spring about the latter end of the same month: But Mr. *Bliths* directions are to make the hills after that they are Poled, and tied to their poles, when says he your Hops are grown two foot high, bind up with a rush or grass such of your springs to the Poles as do not of themselves, winding them as oft about the Poles as you can, and wind them according to the course of the Sun, but not when the dew is upon them, your rushes lying in the Sun will toughen, says he, but surely better in the shade.

And now you must begin to make your Hills, and for that purpose get a strong Hoe of a good broad bit, and cut or hoe all the grass in the borders between your hills, and therewith make your hills with a little of your mould with them, but not with strong weeds, and the more your hills are raised, saith

saith he, the better, the larger, and the stronger grows your Root, and bigger will be your fruit. But this Rule is not subscribed to at *Farnham* where they esteem their Gardens best order'd where the hills are made greater or less in proportion to the strength, and bigness of the Hop-root.

And whereas Mr. *Blith* orders that from the time of the making of the Hills, the Gardiner should be ever and anon raising his Hills, and clearing his ground from weeds until the time of gathering; the observance at *Farnham*, and divers other places, is only this, That in the beginning of *August*, or latter end of *July*, about the time that the Hops begin to blow after a good rain, they rake up earth from the spaces, and renew the hills again.

In the first year suppress not one Cyon, but suffer them all to climb up the Poles, for should you bury the springs of any of your Roots it would die, so that the more Poles are required to nourish the Spring.

But after the first year saith Mr. *Blith*, you must not suffer above two or three others, say not above four or five stalks to go to one Pole, but pull down and bury all the rest. Yet you may let them grow four or five foot long, and then choose out the best for use. As soon as your Pole is set, you may make a circle how broad your hill shall be, and then hollow it that it may receive the moisture, and not long after proceed to the building of your

your Hills. What he adds, that where your Hops are higheſt, there you muſt begin again, and pare again, and be alway paring up, and laying it to the heap, and that with ſome mould until the heap come to be near a yard high, is contrary to the practice both at *Farnham* and other places: For the higheſt Hills they make, are not above half a yard, or two foot high at moſt, neither do they tye themſelves to ſuch continual attendance in paring and adding to the Hills.

It is a queſtion, whether if the Hop attain not to the top of the Pole by the midſt of *July*, it be not good advice to break off the top of the ſame Hop, that the reſt of the time may ſerve to nouriſh the branches, which otherwiſe would looſe all the running up, being no advantage to the ſtock or increaſe of the Hops. Mr. *Blith* holds the affirmative part, but others there are who do aſſert the negative, and alleadge for their reaſon, that they find by experience that the beating off the tops in this manner, maketh the Hops bleed, and is very prejudicial to them.

At *Farnham* alſo, which is accounted as good a ſoyle for Hops, and as ſecure from Blights as any in *England*: I find their Gardens planted not upon moiſt or boggy ground, but rather upon a marly loomy mixt ground upon the the declivity of their heaths, and the ſoyle they uſe is throughly rotten, for they have an obſervation, that if the Dung

which

which they employ about their Hills, be new and fresh, it certainly breeds the blight.

For the drying of their Hops, they do assoon as they are gathered, put them on a Kill, some use the same Kills which they employ for the drying of Malt, upon which, though they lay them near a foot thick, they will be dryed in twelve hours. They must be dryed without smoak, and therefore generally they dry them with Charcoal. But some under their Kill have an Iron furnace about two foot square, with a close grate, into which they put in Seacoles, and with a Vent or conveyance for the smoke, which Iron furnace being kept glowing hot with the Seacoles, gives heat enough for the Kill, nor doth the smoke of the Seacole annoy the Hops, because it is kept in.

Others in the Neighbouring Villages dry their Hops with wood that is light and dry, but in other Countries with Wheat straw, for generally they dry their Hops with the same Fuell that they dry their Malt, and use the same diligence that they be not prejudiced by the smoke.

Saffron delights in a reasonable good and dry light ground, not extreamly soyled or moist, 'tis planted chiefly in some parts of *Essex*, *Suffolk*, and between that and *Cambridge*, at *Saffron-walden*. They are set in the manner of Bulbous roots, being taken when the Bulbe is at the fullest, commonly *Saffron.*

monly about *Midſummer* the Bulbs are ſet by a line, (that the beds may be weeded with a Hoe) and that either with a ſetting ſtick, or by trenches made in the manner of thoſe wherein garden peaſe are uſually ſowed. This bears in the middle of the flower three chives, which is the Saffron, to be gathered every morning early and dryed for uſe, every ſecond or third year at the furtheſt the beds muſt be replanted, and the off-ſets drawn away.

Skirrets are propagated uſually by Slips taken from the head of the root, where many of them are ſet together with white ſtrings, and theſe muſt be planted in very rich ground in *March* at a foot diſtance, or thereabouts, each Plant being kept Hoed afterward: at two years end they are taken up in great roots, and reſerved to be eaten.

The general way of this propagation, is to take the off-ſets that riſe from the Bulbous and tuberous rooted Plants, as Tulips, Anemones, Narciſſes, Crocus's, &c. and the ſuckers which from the roots of Poplars, Elmes, Nut-trees, Pears, Burts, Nurſgardens, Kentiſh-Codlings, Gooſeberries, Roſes, Ruſcus, Calamus Aromaticus, are very plentifully drawn, and more or leſs from all mentioned in the Catalogue *Num.* 1. *Chap.* 2. and to replant them in the ſeaſons of ſetting, which are related in the proper chapter for that operation, into proper beds, and in convenient

nient distances for their future education and growth.

Num. 3. *Variety of colours in what Flowers, from what off-sets.*

Our Gardiners respect most the roots of widdows, for that they find by experience that they multiply the variety of Tulips not only from seeds, but from the Off-sets of these widdows: I my self have seen admirable declensions of them from their natural purple and white.

The royal Crocus striped, gives now and then very pretty variety from its Off-sets, as sometimes I have seen on the same root an ordinary striped Crocus, and another of a perfect flame colour, though the variety here be not so great as in Tulips.

And seeing it is evident that variety of colours sometimes cometh from the weakness of the Plant, some Art may be used to alter the colours, not only of Off-sets, and slips, but also of the flowers that arise from Mother Plants. For in Tulips, and Anemonies, and in Stock-gilliflowers, and divers others, I have seen the flower grow paler and more striped as the Plant hath been weakened. And Mr. *Rea* telleth us, that as the expert Gardiner endeavours to recover such sickly roots of choice flowers, so purposely he infects others with sickness that are more vulgar, by taking

taking up the roots a little before they come to flower, and laying them in the Sun to abate their Luxury, and to cause them to come better marked the year following: This, saith he, I have often done with strong and lusty roots of the Pass-Oudmard, Pass-Cittadel, Pass-Heron, Agot Robin, Turloon, Widdows, and such like ordinary flowers, and commonly found the success answer my expectation in many, and some of them to come so well marked, that they might be taken for much better flowers then they are: some think to produce variety of colours by grafting, or joyning artificially the stems of Carnations or Cloves of Tulips of divers colours. But this cannot hold, for every bud and clove that groweth will send forth leaf and flower after its own kind, as it happens in the inoculation and grafting of Roses, and other Plants.

Concerning the manner of growth by Off-sets, there is little to be spoken particularly, their roots being actually made while they remain upon the Mother-Plant, and their growth being like that of other well rooted Vegetables.

CHAP.

CHAP. III.

Of Propagation by Stems, Cuttings or Slips.

Of this way of Propagation *Virgil* ſpeaks,

Nil radicis egent aliæ, ſummumque putator
Haud dubitat terræ referens mandare cacumen.
Georg. 2.

Some need no root, nor doth the Gardner doubt,
That Sprigs, though Headlong ſet, will timely (ſprout.

Num. 1. A Catalogue of Plants this way Propagable.

Abrotonum Unguentariũ.
Balſamita.
Barberies.
Baſil.
Baſilmint.
Bay.
Baume.
Box.
Brooklime.
Burts, and generally all ſuch Plants as break out into protuberances like warts upon the bark.
Bugle.
Cornelian Cherry.
Many *Crowfoots.*
Dorias his woodwort being cut off near the root.
Elder.

Elder.
Evergreen-Privet.
Germanders.
Gilliflowers.
Hyſſope.
Jaſmine.
Kentiſh-Codlings.
Knot-graſs.
Lavander.
Lawrel.
Marjerome.
Marſh-mallowes being taken up near the root.
Maſtique.
Mulberries.
Nurſegardens.
Penny-royal.
Periwincle.
Pinks.
Polium montanum.
Prunella, or *ſelf-heal.*
Quinces.
Some *Roſes*, as the ever green Roſe.
Roſemary ſet before the end of *April*, but beſt in *February* or *March.*
Rue in a ſhadowy place
Sage, both *Engliſh* and *French.*
Savory.
Savin in moiſt ground, and ſhadowy.
Scordium.
Southernwood.
Spearmints.
Strawberries, and generally all Plants that have joynts upon creeping ſtrings.
Thime.
Tripolium.
Veronica erecta.
Vines.
Violets.
Wall-flowers.
Watercreſs in water.
Withy.
Willow.
Woodbine.

Num. 2. *Explication of the manner of propagation by Stems cut off from the* Carnations. *Mother-plant, or ſlipt by Example and Rules for particular direction.*

For

For Example, I shall chuse to instance in Gilliflowers or Carnations, for which flowers observe this order. Seek out from the stems such shoots only as are reasonable strong, but yet young, and not either too small or slender, or having any second shoots from the joynts of them, or run up into a spindle, cut these slips off from the stem or root with a knife, either close to the main branch, if it be short, or leaving a joynt or two behind, if it be long enough, at which it may shoot anew. When you have cut off your slips, you may either set them by and by, or else, (as the best Gardiners use to do) cast them into a tub of water for a day or two: then in a bed of rich and fine mould, (first cutting off your slip close at the joynt, and having cut away the lowest leaves close to the stalk, and the uppermost even at the top) with a little stick, make a little hole in the earth, and put your slip therein so deep, that the upper leaf may be wholly above the ground. Some use to cleave the stalk in the middle, and put a little earth, or clay, or chickweed, which we more use, within the cleft: this is Mr. *Hills* way in Sir *Hugh Plat*; but many good and skilful Gardiners do not use it; then close the ground unto the stem of the Plant. *Gilliflowers.*

As for the time, If you slip and set them in *September*, as many use to do, or yet in *August*, as some may think will do well, yet (unless

they be the most ordinary sorts which are (likely to grow at any time, and in any place) the most of them, if not all, will either assuredly perish, or never prosper well: the season indeed is from the beginning of *May* to the middle of *June* at furthest.

Ferrarius Lib. 2. c. 15. sayes, that from the Month of *February* to the middle of *March* (viz.) in the time of their germination, is the best time to slip this flower. He neither will have them slipt, nor twisted in the Root, nor Barly put under them to raise adulterous fibres, but only advises that they be cut off in a joynt. The truth is, both the Spring and Autumne are good Seasons for making out Roots, the latter requires that the slips be so early set as that they may have time enough to take root, before the coldness of winter: The former, that the Plant set in the Spring, may have taken root before the Sun rises to emit violence and parching heats, which are general Rules for Vernal & Autumnal setings.

Concerning the continuance of double Stock-gilliflowers more years then one, *Mr. Rea* writeth thus, Many are of opinion (saith he) that double stocks raised from seeds longer then the first year of their bearing flowers, are not to be preserved by any means, but I know by experience they are mistaken. It is true, that commonly the old Plant being all run up to the flower, dyeth the next Winter, but the cuttings will grow and bear the next

spring

ſpring following. All the Art is in ſetting them, which muſt be performed in manner following, firſt make choice of ſuch branches as do not bear flowers, the which cut off ſome diſtance from the ſtock, ſo that they may not be too long, Then ſlit down the bark at the end of the ſlip about half an inch in three or four places equally diſtant one from the other, according to the bigneſs thereof, which peel as far as it is ſlit and turned up, then cut off the naked woody part cloſe to the rinde that is turn'd up, make a wide hole, and ſet the ſlip therein three fingers deep, with the bark ſpread open round about the end thereof, then cover it, which being ſhaded for ſome time, and watered, if the ground be any thing good, will grow and proſper very well: And certainly this is the beſt, and moſt abſolute way to raiſe double ſtocks of any kind that hath been practiſed by any; and in the like manner you may cut and ſet ſlips of the beſt Wallflowers, Gilliflowers, or of any other woody Plant that will grow of ſlips.

Woody plants that bear leaves muſt be taken off, and planted ſome time between the fall of the leaf and the ſpring: Some prefer the planting them in the beginning, ſome at the going out of the winter about the beginning of *February*. Immediately when the great froſts break, at the firſt towardneſs to ſpring is a good ſeaſon according to general beleif.

Experiments made of the ſucceſs of the cuttings off divers Plants ſet in water.

Becauſe in ſome diſquiſitions of natural Philoſophy, there may ſome Matter of argument ariſe from Experiments of the conveſion of Water into nutriment and ſubſtance of various and thoſe very different Plants, whereof ſome are Hot, others Cold, ſome eſteemed of a Freſh, others of a Salt nature, ſome in regard of mans body of Healing, others of Excoriating and Bliſtring qualities, ſome Specifiques for the head, and the Diſeaſes thereof, others for the Heart, and others for the Womb: I ſhall ſet down the truth of ſome few Trials concerning the growth or corruption of ſuch cuttings of divers Vegetables as without roots I kept in my chamber in Vials of water. Not deſigning thence to make any motion towards the Reſtauration of the ancient doctrine concerning the production of all things out of water, or to take up the ſcatter'd judgments of the once renowned *Thales*, which he made from the obſervation of the Generation of fiſhes, and Petrifaction by this element, as likewiſe from the influence (for he was aware thereof) and cauſality it has in the production and nouriſhment of Vegetables, and (if not immediately) by conſequence of animal bodies. Nor deſiring to make from theſe Experiments

riments (though I believe the instance may be as well proper as specious) any argument for the more fashionable opinion of *Epicurus*, by shewing the various Productions that may be made by the divers Shufflings and Positions of that which has the repute of the most pure and defecated element, but clearly intending to keep to my task, which is History, and rather to serve, than to be the Philosopher: I in short rather content my self to give the Reader this account: That *May* 1658, in Glasses of water the Plants following grew from cuttings, and made themselves roots in the water, by name, they were *Balsamita minor*, *Mints*, *Sedum multifidum*, *Penny-royal*, *Bugle*, *Prunella*, *Water-cresse*, *Purple-grass*, *Periwincle*, *Dorias* his *wound-wort*, *Crow-foot*, *Brooklime*, *Marsh-mallows*, *Lawrel*, *Scordium*, *Tripolium*, *Knot-grass*, *Nummularia*, *Minima*, *Basil-mint*, *Curl-mint*, *Horse-mint*, *Panaxcoloni*, *Feverfew*, and some others which I kept no account of, I have had at other times.

Plants that upon trial made by cuttings *May* 1658, did not grow being placed in Vials of water, were *Mugwort*, *Rosemary*, *Stock-gilly-flowers*, *Alaternus*, *Lavander-cotten*, *Sage*, *Armeria's*, *Camomil*, *Rosemary*, *Polium-montanum*.

Stock-gilly-flowers, *Bawme*, *Tansy*, *Groundsel*, *Lavander-cotton*, *Sage*, *Majorane*, being likewise set in glasses of water dissolved into a muscilage, and so corrupted before they attained to any roots.

Plants that were corrupted by the water in some parts of the stems, and so died after leaves sent forth and roots shot, were *Basil*, *Mint*, *Marshmallows* after it had grown a span, *Panax-coloni*, *Balsamita minor*, after six weeks growing, which made me doubt whether there were not the same reason of the dying of these Plants, that there is of grafts of Pears upon Apples, or Apples upon thorns, which grow for a while, it may be some years but surely die before they arrive to any maturity: and secondly, whether this reason was not the unlikeness and diversity of parts between the stock to be nourished, and the nourishment apposed thereunto, for though some died after leaf and growth made, as purple-wort particularly by running into a Muscilage; yet generally there appeared no such evident cause of their failing.

Plants that increased in weight, small sprigs of them being cut and Planted in Vials of water, were these, and the quantity thus much.

Sedum multifidum in a month increased in weight, half a scruple: *Scordium* as much in a fortnight. *Dorias his woundwort* grew in six weeks gr. 13. *Bugula* in some what less time gr. 15. *Water-cress* gr. 25. in a Month. *Ranunculus* half a scruple in six weeks, and *Periwinckle* as much. *Prunella*, *Brooklime*, and most of the sorts of mints, got weight proportionably.

There are some Experiments of that great Vertuoso Mr. *Boyle*, which are very proper to be

be annexed here, and the Reader had not miſſed to have had ſome intimation of them in my former Edition had that moſt ingenious and truly Philoſophical Diſcourſe, which he entitles his *Sceptical Chymiſt* been then publiſh't: And now that piece being in few hands and out of Print alſo, I ſhall give you the Relation of them at large, as I find them ſet down in the 107, and 108 pages. 'I, ſaith he, 'cauſed my Gardiner in *May* to dig out a con-'venient quantity of good earth, and to dry it 'well in an Oven, to weigh it, and to put it in 'an earthen pot, almoſt level with the ſurface 'of the ground, and to ſet in it a ſelected ſeed 'he had before received from me for that pur-'poſe, of Squaſh, which is an Indian kind of 'Pompion that grows a pace; this ſeed I 'ordered him to water onely with rain, or 'ſpring water. I did not (when my occaſi-'ons permitted me to viſit it) without de-'light behold how faſt it grew though unſea-'ſonably ſown; but the haſting Winter hin-'dred it from attaining any thing near its 'due and wonted magnitude, (for I found 'the ſame Autumn in my Garden, ſome of 'thoſe Plants by meaſure as big as my middle) 'and made me order the having it taken up, 'which about the middle of *October* was care-'fully done by the ſame Gardiner, who a 'while after ſent me this account of it; *I have* 'weighed, ſaid he, the Pompion with the 'ſtalke and leaves, all which weighed three

'pound wanting a quarter, then I took the 'Earth, baked it as formerly, and found it 'just as much as I did at the first, which made 'me think I had not dry'd it sufficiently: 'then I put it into the Oven twice more, after 'the bread was drawn, and weigh'd it the 'second time, but found it shrink little or 'nothing.

'Experiment 2. To give you an account 'of your Cucumbers, I have gained two in-'different fair ones, the weight of them is 'ten pound and an half, the Branches with 'the roots weighed four pounds wanting 'two ounces; and when I had weighed them, 'I took the earth and baked it in several small 'earthen dishes in an Oven, and when I had so 'done, I found the earth wanted a pound and 'an half of what it was formerly, yet I was 'not satisfied, doubting the Earth was not 'dry: I put it into an Oven the second time, '(after the bread was drawn) and after I had 'taken it out and weighed it, I found it to be 'the same weight. So I suppose there was no 'moisture left in the Earth. Neither do I 'think that the pound and half that was wan-'ting, was drawn away by the Cucumber, but 'a great deal of it in the ordering was in dust, 'and the like, wasted.

To which he adds a third Experiment of the great *Van Helmont* in these words; 'He 'took two hundred pound of Earth dryed 'in an Oven, and having put it into an Ear-

'then

'then vessel, and moistened with Rain wa-
'ter, he planted it in the trunck of a Willow-
'tree of five pounds weight: This he water-
'ed (as need required) with rain, or with di-
'stilled Water, and to keep the neighbouring
'Earth from getting into the Vessel, he em-
'ployed a plate of Iron tin'd over and per-
'forated with many holes. Five years being
'efflux'd, he took out the tree, and weigh-
'ed it, and (with computing the leaves that
'fell during the four Autumns) he found it
'to weigh 169 pounds, and about three
'ounces. And having again dried the Earth
'it grew in, he found it to want of its former
'weight of 200 pounds onely, about two
'ounces, and having again dried the Earth
'it grew in, so that one hundred sixty four
'pounds of the Roots, wood and bark which
'constituted the Tree seem to have sprung
'from the water.

Num. 4. *The manner of growing by Cuttings.*

Such who desire to observe the working of Bees, get Casements to their Hives, that their eyes may not suffer impediment from the darknes of the place, For prevention of the same hindrance, the use of beds of a Diaphanous soyl, in as Diaphanous bounds, or plainly of water in a glass, I have found a proper remedy; and shall therefore from my observation of the growth of these particulars de-

fire

ſire the reader will imagine the reſt, or judge them alike, as truly (for what I remember) I have always found them.

For the manner of Plants growing by water, I obſerved that thoſe Plants that had many joynts, eaſily grew and put forth roots only juſt at the joynt. *Knot-graſs*, *Crow-foot*, *Panax-coloni*, all ſorts of *Mints*, *Penny-royal*, *Scordium*, *Bugle*, *Brooklime*, *Periwincle*, which I conceive to be the reaſon why in ſetting them the practice is, to cut off the Plant juſt in a joynt, for ſo the roots immediately ſpring thence, and no part of the ſtem corrupts, which it would, if it were cut off at the greater diſtance.

In thoſe herbs where there were no exact joynts, the roots ſprung forth under ſome buds, as in *Tripolium*, *Dorias* his woundwort, *Marſh-mallows*.

Every root that was made, came forth firſt very white and ſingle, but afterward in very handſome order and proportions, from thence aroſe other fibres ſtriking every way in the water, where the ſide of the Vials made no impediment to the growth of the ſpurs iſſuing from the firſt and original root.

CHAP.

CHAP. IV.

Of Propagation by Laying.

Num. 1. *What Plants are this way encreased.*

THe Plants that are usually propagated this way, are Vines, Woodbines, Myrtles, Jasmines, Mulberries, Savin, Roses, Horse-chesnut, Evergreen privet in Woods, all sorts of Willows and Sallows to fill up bare places. Of these *Virgil*,

Sylvarumque aliæ pressos propaginis arcus,
Expectant & viva suâ plantaria terrâ. Geo. 2.

Some Trees require their boughs beset arch-wise,
And make their own soyle living Nurseries.

Carnations, Gilliflowers, and among flowers generally all those Plants that will grow by Cuttings, will this way grow with much more ease, by care and good watering. Gardiners do apply this way with profit to such Plants, as cannot well by any other means be encreased for want of seeds and off-sets, and by reason of the repugnancy of their nature to grow either by cuttings and Insition.

Num. 2.

Num. 2. *The Example of this manner of Propagation.*

The moſt uſual flower to be laid in Gardens, is the Gilliflower which every Gardiner here uſeth, and is thus performed; Take thoſe ſlips you intend to lay, and cut the ſtalk juſt under that joynt of the ſlip, which is next the root or middle ſtem, or under the ſecond joynt half way through the ſtalk: then ſlit it upward to the next joynt from that, under which you made your firſt inciſion, and put the top of a Carnation-leaf, or any other thing to hold open the ſlit, (though that be not altogether ſo needful, for the cut being made on the lower ſide, and the ſlip being towards the root bent down gently, as the manner is, and the top of the ſlip raiſed with mould, the ſlip will be open of its own accord and remain ſo if you place it well) at the firſt ſome peg down the middle of the ſlip with ſticks, that it may not riſe from the poſiture in which tis firſt laid, you muſt remember to put good earth, enough to mould up your new Nurſery, and to water it upon all occaſions with water that is Sun'd, or in which Sheep dung is ſteep't, but ſo clear, as not to breed flie, lice, or other Vermine, and then in ſeven or eight weeks you may expect Roots.

Num. 3.

Num. 3. *Requisites for the manner of laying.*

1. To laying, 'tis profitable, if not necessary, that you (in the season of doing this operation) cut the thing you lay, much in the manner you cut Gilliflowers, in laying them, enlarge the cut two or three inches long, more or less, according to the bigness of the branch, unless in some Plants that take any way, as Vines, and 'tis so much the better, if in Roses, and other Layers of a woody substance, with an Awle you prick the stock at the place laid, as it is done in propagation by Circumposition.

2. Another Requisite is, that during the time of drought, they be continually watered, and kept moist, otherwise they will make no exact roots, perchance only a kind of knob or button full of fresh sap upon the tongue of the cut in the branch laid down, yet I have found these branches cut off with watering in the summer, to grow well enough after their transplantation.

3. The season most fit for this operation, is, in the beginning of the spring or declension of the torrid heat of summer, that they may enjoy the moistness of such seasons most proper for the enticing forth of roots, and most safe from excessive heat or cold.

Mr. *Rea* adds another direction, *viz.* 'That in such Plants as are unapt to root, you bind the

the upper end of the slit very hard with a Pack-thread or Wier, which will stop the sap, and hasten the effect desired. To facilitate this Operation, some commend, and use Layer-pots, which are made on purpose with a hole in the bottom, to let out the water, if there should be too much, and with a slit on one side. The Operator placeth it in the ground by the side of the Gilliflower, and bringeth in one of the choicest slips at the slit, so that the top of it should be above the top of the small layer pot, and the lower part shall be in the pot filled with earth, wherein it strikes his root.

Num. 4. *Of Propagation by Circumposition.*

Circumposition is a kind of laying; The difference is, that in this the mould is born up to the bough which is to be taken off: in laying, the bough is to be depressed into the mould. We use this most in Apples after this manner, First disbark the bough a little above the place where it is separated from the main Stock or Arm, so that the Hat, or other Vessel, that holds up the Mould to the Incision, or disbark'd place, may rest upon the stock, then slit an hat, an old boot, or take any strong peice of old course cloath, tying or sowing it so strongly, that it may be able to hold up the mould to the incision; Sometime before you fill this Cap with Mould, remem-

remember with an Awle or point of a penknife, to bore two rowes of holes upon the upſide of the cut, about half an inch or more, one from another, then fill it with good mould, or ſuch as is agreeable to the tree you work upon, and in the heat of Summer, water it now and then. The time of this operation is not in the Summer, as Mr. *P.* ſuppoſes (which miſtake was ſufficient cauſe why he ſhould not like the Experiment) but in the Spring before the ſap riſes, particularly in *February*, or the beginning of *March*.

Such Plants are propagable this way that might take by laying, but that the branches are too far riſen from the ground to be laid along therein; and therefore it becomes neceſſary, ſince they cannot ſtoop to the earth, that the earth ſhould be lifted up to them.

Num. 5. *Of the manner of growth by Circumpoſition, and whether thence an Argument may be made for the deſcenſion of Sap.*

Concerning the manner of growth by Circumpoſition, I ſhall only make this remark, whereas it is ſuppoſed by ſome, that the roots are made above the disbarked place, by the deſcention of the ſap, which is ſuppoſed to be at the fall of the leaf, I have found experience very contradictory to their ſuppoſals; for the leaves fall not till after Michaelmaſs; and

and nature proceeds to the germination, and encrease of Roots from the Spring all the Summer long, so that nothing can be argued rightly from this operation, or from the effect and product of nature thereupon, for that opinion, which makes the sap to be every Winter reposed in the Root, as in a large receptacle, and of its descension thither after every Autumne. If it were there as in a Repository, it were a wonder that roots should be dryer in *December*, then in *May*, or *June*, and sensibly more void of juice. And if it did descend after Autumne, how could it ascend at the same time? That it doth then ascend, is plain from this Experiment; Take up a tree, or other vegetable, in the fall of the leaf; the leaves will wither, and the bark begin in a little time to wrinkle; then set it again in a proper soyl, well watered; the effect will be, that the leaves will recover freshness, and the bark wax plump, and the body firm, and full as before, which could not be but by a fresh supply of ascending sap, which might fill up the pores made by the weather, and exhalation of the Sun. I am contented to believe that the sap is in Winter where I see it to be, (*viz.*) on the body of the tree coagulated, or crusted into a new coat, encompassing the whole, which was not extant the year before, and on the top fashioned into new shuits, which visibly appear the product of that matter, the place of which is asserted to be elsewhere,

and

and not where upon the most sedulous inquest it cannot be found.

CHAP. V.

Of Insitions.

Num. 1. *Of Grafting in general, and particularly of Shoulder-grafting, Whip-grafting, Grafting in the cleft and Ablactation.*

GRafting is an Art of so placing the Cyon upon a stock, that the Sap may pass from the stock to the Cyon without Impediment. For the right operation of which, it is a chief remark, that the space which is between the bark and the stock, is the great Channel for conveyance and keeping of sap, so that every one that Grafts well so orders the manner, that these spaces be so laid, that the passage may be easie, and direct from the space under the bark of the stock, to the space under the bark of the Cyon.

This may be done several ways.

First by Shoulder-grafting, the operation of which Mr. *Austin* do's well describe thus: Cut off the top of the stock in some smooth

ſtreight place, that may anſwer to the ſtreightneſs of the graft when ſet on; then prepare the graft thus, obſerve which ſide is ſtraighteſt at the bottome, or biggeſt end, ſo that it may fit the ſtreight part of the graft when ſet on, then cut one ſide only of the graft down aſlope, about an inch long or little more, and cut through the bark at the top of the cut place; and make it like a ſhoulder, that it may reſt juſt upon the top of the ſtock, but cut not this ſhoulder too deep, (only through the bark, or a little more, and the leſs the better) but cut the graft thin at the lower end of the cut, ſo that it may decline in one continued direct ſmoothneſs, without dents, ridges, ſpaces or winding all along the ſlope, from one ſide of the Cyon to the other, otherwiſe it cannot joyn in all places to the ſtock. The graft being thus prepar'd, lay the cut part of the graft upon the ſtraight ſide of the ſtock, and meaſure juſt the length of the cut part or ſlope of the Graft, and with your knife take off ſo much of the bark of the ſtock, (but cut not away the wood of the ſtock) then lay the cut ſide of the graft upon the cutſide of the ſtock, and let the ſhoulder of the graft reſt directly upon the top of the ſtock, ſo that the cut parts may joyne even and ſmooth all along: the inſide of the bark of the graft being placed upon the inſide of the bark of the ſtock, and ſo joyne them faſt together with ſome ſtrong

ſtrong Ruſhes or Flags, and clay them on every ſide that no Rain get in.

If the ſtock be very little, the way of grafting is the ſame, only excepted, that in this caſe there muſt ſome of the ſubſtance of the wood be taken away, that the graft in its ſlope be not too big for the cut in the ſtock, in which operation ſo much there muſt be taken from the ſtock, that the inſide of the bark of the graft, may anſwer the inſide of the bark of the ſtock, which being done, all things elſe are the former way performed. This is call'd Whip-grafting, and is oppoſed to the former wherein no wood is cut from the ſtock. For, for Shoulder-grafting it is required that the ſtock be not over big; for then the bark being taken from it there, will not be a right application of the Sap-channels of the Cyen and Stock mentioned in the definition of Grafting: The disbarked place in great ſtocks being neceſſarily much greater then the diſbarked or cut place in the Cyen to be fitted to that ſtock; yet if the ſtock be not three inches circumference, the Artiſt may open ſo little of the ſtock as to make the graft applicable enough. For he may ſo ſlice it up as to open no more of the real wood, then the wood in the bark will reaſonably well cover. Which if it cannot be done by one ſtraight cut, yet the bark may be mark't on either ſide of the graft with the Artiſts knife, and then dig'd out, or lifted up, and this way will

ſuit with ſtocks of any bigneſs if the Gardiner obſerves this Circumſtance, that where the bark is very thick and cruſty, there it being firſt mark't with the Pen-knife, even with the ſides of the flat part of the Cyon, and then cut and lifted up on the ſides, the end of the label of the bark at the foot of the Cyon be not cut off at all, but tied again upon the Cyon to keep it cloſe to the ſtock, which otherwiſe, where the bark is thick, would probably ſit looſe.

Of the wayes before mentioned, the one is called Shoulder-grafting, becauſe the upper end of the down-right cut in the Cyon is indented or cut with a Shoulder, and ſo made fit to lean upon the Shoulder of the ſtock.

The other way is called Whip-grafting by our Artiſts, becauſe of the diſpatch that is in it. For the operation therein, maketh but one ſtraight down-right cut in the Cyon, and the like in the ſtock, and ſo tarrieth not to cut Shoulders, Indenters, or Lips, or make any further Operation.

I muſt not here conceal that there is now come in practice a very uſeful diverſity in this way of Shoulder-grafting, uſed firſt as I think by Mr. *Bobart* our Oxford Phyſick Gardiner. The way is this, The Graft being prepared as for Shoulder-grafting, the Grafter ſlits or cleaves with his Pen-knife the inward face of the Cyon in the cut part, or at leaſt lifts up the bark on that ſide on which the Cyon is

applyed

applyed to the ſtock, ſo that one lip of the cleft Cyon is bound on the one ſide of the ſtock, and the other longer lip on the other ſide, as in the plainer way of Shoulder-grafting. For the lip of the Cyon is in this operation cleft. And this is ſurely the beſt way of grafting in the cleft. For it hath the ſtrength of the other, and the wound cauſed by the cleft, doth recover ſooner in the Cyon then when made in the ſtock. The Cyon being thus ſlit, and tyed as it were upon its ſaddle, with its legs on either ſide of the ſtock, ſits much more ſtrongly on, and doth much better reſiſt the force of the winds, and other caſualties (which theſe new and weakly cemented conjunctions are ſubject to) then thoſe which are tied only to one ſide of the ſtock are able to do, and to prevent which Caſualties, Gardiners that uſe the Shoulder-grafting have been forc'd to tye up their grafts with Splinters, where the ſtocks may probably ſhuit long Cyons, and ſtand open to the Winds.

The common way of Grafting in the Cleft, hath been of long uſe, and is generally known to all Gardiners. The ſtock muſt be cleft in a ſmooth place, and even, and the cleft ſo prepared with your knife in the cleaving that the ſides be not ragged. Then both ſides of the bigger end of the Cyon are to be cut down ſlopewiſe, and at the top of the cut, Shoulders may be made or not made at plea-

ſure. Mr. *Auſtin* well adviſeth that the outſide of the graft be bigger in the wedge, or cut place, then the inſide, unleſs the tree be big: But on the contrary, if the ſtock be ſo big as to be apt forcibly to pinch the graft, that then it is convenient to make the inner ſide of the wedge a very little thicker then the other, that ſo it may preſerve the outſide (where the Sap-channel is) from being pinched, ſo as to make the bark of the Cyon ſit looſe, and not receive the Sap from the ſtock into the common channel in ſuch a manner as is neceſſary for the uniting of them.

Some think this way of Grafting in the Cleft, fit onely for great ſtocks, but I have often grafted Seedlings this way that were ſo very ſmall, that the Cyon was put in like a wedge, and was very even to the ſtock on each ſide, neither Stocks nor Cyens being near an inch round, but if ſmall Plants are this way grafted, they muſt be tied about after the former manner uſed in Shoulder-grafting. And the wound made by cleaving, is very quickly made up, and cemented by the Balſam of the Sap when a young ſtock is grafted, whereas in old ones it is quite contrary.

There are alſo many more wayes of Grafting, for if you conſult the Figures of Inoculation, you will find that Cyons of Apples may be pack'd on, the bark being cut according to many of the figures there deſcribed, and the ſtock cut off juſt above it; as for inſtance,

The Exemplification of the Operations by the Figure.

a Denotes the ordinary cutting of the Bark for Inoculation.

b b The sides of the Bark, lifted up for the putting in of the Shield.

c The Shield taken off with the Bud, which lies under the Stalk of the Leaf cut off.

l n The Shield put into the Stock to be bound up.

d The Bark cut out in an oblong square, according to another usual way of Inoculation.

g The Shield cut out for the fitting the disbarked square.

m The same Shield put into the Stock.

f A variation of the forementioned way, by cutting off the upper part of the oblique square, and binding the lower part down upon the Shield.

o The Shield so put in to be bound up.

e Another variation by slitting the Bark, that the Bud and Leaf may stand forth at *e*, and the Bark slit be bound down upon the Shield.

h A cross cut for Inoculation.

i The same cross cut lifted up in this Figure, somewhat too big.

k The Shield cut off to be put therein.

p The Shield put in.

g or *q* The cut of the Cyon or Stock for whip-grafting.

r 7 The cut of Cyon and Stock for Shoulder-grafting.

s The cut of the Cyons, and slit of the Stock for Grafting in the cleft.

x The Stock set for Ablactation or approach.

u The Cyon of the Branch for the same operation.

1 2 The Branch that is to be taken off by Circumposition.

3 The Branch that bears up the mould to the dis-barked place.

4 The Branch of a Carnation to be laid.

5 The joynt where the slit begins.

6 The next joynt where the slit is propped open, with a peice of a Carnation Leaf put in.

Add this to the 119 Page.

ſtance, according to the figures mark'd with the Letters (*a*) (*b*, *b*) (*d*) (*e*) (*f*)

Ablactation is the ſame with Grafting, ſaving that in that way the Cyon remains on its own ſtock, and on the ſtock you graft together. For the ſtock you graft, being planted by the Tree from which you have your Cyon, you disbark and cut the Cyon, ſo that the inward part of its bark may anſwer the like disbarked place in the ſtock, ſo they being bound up together, and not ſeparated till you are ſure they are ſurely incorporated, at which time the Cyon is cut from its own, and lives only by the other Stock.

It is an ordinary imagination that by this way of Ablactation, Heterogeneous conjunctions may be made to proſper, but thoſe that conſider that the cauſe of the impoſſibility of diſſimilar plants, thriving by any way of Inſition, is not the difficulty of their firſt uniting, but the diſability of the root and ſtock to nouriſh the head with convenient nouriſhment, will not eaſily admit ſuch a fancy; Peares upon Apples, and Services; Apples upon Thorns, and the like plants will with eaſe take, and continue in good growth longer than ſuch time as is required that the Cyon ſhould depend upon the Mother-plant in Ablactation for the faſtning of it till cementation be made; But after a perfect conjunction, and that great ſhuits have ſprung out, they (almoſt conſtantly, notwithſtanding

the great care) will dye, which is an evident signe that this way can administer no help, it only providing that nourishment be not wanting to the first months, and not securing them from the danger of wanting for the future, fit and wholesome Nutriments for their maintenance and growth.

Num. 2. *What Plants take on different kinds.*

This is a general rule for Grafting, Inoculation, Ablactation, and conjunction by penetration, or any such way of Propagation, that the Cyon, or thing implanted, be of like nature to the stock. But to tell what nearness in every kind is enough, is matter of greatest Art; 'Tis known that Plums will not grow upon Cherries, nor Pears upon Apples for many years, though for a while they may prosper.

I find that divers Plants will take by enarching or Ablactation, that will not take by Grafting; so Grapes, as the early red upon the great Fox-grape; Apricots also and Peaches, which being secured upon their own stocks, will admit implantation unto another also, and take unto it, which by grafting I could never bring them to.

The strangest conjunctions that we observe to agree, are the Whitethorn with the Pear, Quinces with the Pear, the Pear with the Quinces,

Quinces, the Medlar with the White-thorn, the Apricots with Plums that are of full ſap, and ſometimes upon hard ſcurvy Plums, moſt uſe the White-Pear-Plums for that purpoſe; I find not but ſome other are as good, (*viz.*) the Primordian, Muſcle, Violet. And it is true, that all roſes cement and continue well upon bryers, as on the ſweet-Bryer, Dogroſe, I have Cherries that grow upon Plum-ſtocks, which is Sir *Hugh Plates* experiment from Mr. *Hill*, p. 113. and Currants upon Gooſeberries: what duration they may be of, I expect to learn. I am not convinced by experience that Pears upon White-thorn are worſe in their fruit, but if ſo, I ſhall prefer Apple-kernells before Crabs for a Nurſery. I have taſted very excellent Katherine Pears without ſtone or hardneſs, that came from a Thorn-ſtock: nor were they ſmaller or harder (which Mr. *Taverner* aſſerts) then ordinary fruit upon the proper ſtock, however I adviſe that ſuch as ſhall for want of Pear, uſe Thorn-ſtocks, that they graft very low, for otherwiſe the Thorn not growing proportionably to the graft, will cauſe the graft to decay, being never able to grow thereon, unto the bigneſs uſual in Pear-trees.

There are almoſt infinite ſtories of ſtrange conjunctions which urge earneſtly for credit, ſome of inciſions made upon animal bodies: The Lord of *Pireſk* had a preſent made him of a Plum-tree branch which bore bloſſomes and

and leaves, which sprang from a thorn that grew in the breast of a Shepheard, this Shepheard having got this Thorn by falling upon a Plum-tree. Raw silk has grown on the eye brow of a Lady, mentioned by *Borellus*, *observ.* 10. *cent.* 1. being drawn through the flesh, to stich up the lips of a wound there, and the growth was so considerable, that it required frequent cutting. And it is also reported, that there was a *Spaniard* lately that nourish't a bramble that grew out of his belly. The Improvement that from these, and the like Stories, the Author in the forecited place proposeth, is that which Blistering plaisters the Bodies of divers Beasts be excoriated and planted anew with silk, fine wool, cotton, or the like. When these new Plantations shall have succeed to any considerable advantage of the Planters, then we also will leave our Vegetable, and apply our selves by these rarer way of Insition to the Improvement of Animal Bodies.

Num. 3. *Rules for Grafting.*

The time of Grafting, possibly is any time of the winter; I have seen Apples grafted in *November*, and at *Christmas*, and yet thrive very well; but the best time is, that which immediately preceeds the spring: If you can, let the Cyons be gathered before the trees shoot their buds, though some will grow now and then,

then, notwithstanding they be sprouted. It is no matter though the stocks are budded; I have at *Easter* grafted above an hundred Apples and Pears together without any fail.

The best way to keep grafts a long time, especially in pretty hot spring weather, is to wrap them all in wet moss, or cover them with earth.

Lute is made with horse-dung, and stiff clay well mix'd together; Mr. *Austin* advises, that in Shoulder-grafting, the Cyon may be put upon the West or South-side of the stock, because if so, those winds which are most dangerous cannot so soon break off the grafts as on the other sides.

If you would have a spreading tree, put in a long Cyon; if a straight tree, put on a short one, or let but one bud thrive.

Good bearing Trees are made from Cyons of the like fruitfulness. Unbind grafts when they have shot great shoots, that the binding eat not into the Tree, strengthen those that are weak, with a stick tied above and below the grafted place, like Splinters to a broken bone, till the cementation be made and confirmed.

If you would have store of any fruit quickly, cut off the head of an old stock, and graft thereon.

To Trees that bear great heads, and are of a fast and binding bark, such as Cherry-tree, some hard Apples, and other kinds of great fruit-

fruit-bearing, and other Plants, it is esteemed necessary by some, to put in more grafts than one, least the sap finding not way enough, the tree receive a check and perish by the disappointment of the sap. However this reason may hold, certainly 'tis prudence to put in more Cyons than one in such trees, least that one failing, the stock likewise die, being bark-bound, and not able to put out a germen.

Cyons are best chosen from the fairest, strongest shuits, not from under-shoots or suckers, which will be long ere they bear fruit, which is contrary to the intention of grafting; the prime use of which, I believe rather to be the expediting, than the improvement of fruit.

Num. 4. *Of Inoculation.*

Inoculation is performed by taking off that eye, or little bud which contains the beginning of a bud provided for growth in the next spring, and planting it so upon another stock that the sap of the stock may without impediment or interrupt course, pass unto the little eye, or (as I may call it) imperfect or inchoate bough, and serve it for Nutriment: For which operation the Bark must be cut either downright, with a cross cut on the top; the downright cut being about an inch long, and the cross cut only big enough to serve for the easie lifting up the Bark: and then the sides

sides being lifted up with a Knife or Quil, the Shield is to be put in, and the lips or sides of the Bark before lifted up, are to be bound down upon the shield: Or the cross cut may be in the middle, and then the shield is to be made picked at both ends (otherwise in the forementioned way, the lower end only is made picked) and the four lips are to be lifted up for the letting in the Shield. Others cut the Bark clean out in an oblong square,& cutting the shield exactly in the same dimensions & figure,apply it to the disbarked place in the stock.Others cut their shield in the mentioned figure, but take not off all the Bark answering the oblong square shield, but leave the lower part on the stock, under which they put the lower end of the shield, & bind it down thereon. Other varieties there may be, and are used, some more of which are delineated in the annexed Figures: To take off the Bud clean from the Cyon, the best way is, to draw the lines of your Shield through the Bark with your Knife, and to take off the rest of the Bark thereabouts, leaving only the intended Shield thereon.

Having so far prepared your Bud before you take it off, remember to open the bark of the Stock, for otherwise the shield will take hurt by the Air, which must be placed upon the Stock with all speed, and bound with something that may be of a yielding nature. The best way of taking off Buds, is with a

Quill

Quill which is cut like a ſcoop, the one half, or two thirds, taken away for about an inch in length at the end: In taking the Bud off, be ſure not to leave the Root behind; And for bindings, uſe any ſort of ſoft Ruſhes that will hold tying, long ſlipes of Linnen or Yarn.

I prefer ſuch binding as need not be taken off till I expect the ſpringing of the Bud, for there is much peril in premature looſing the bonds, yet 'tis neceſſary to unbinde whenſoever the Stock ſwells about the place of Inoculation. The time of Inoculating is, from the firſt time you can get ſtrong Buds that will come off after the froſts are gone in the Spring, till ſuch time as that the Buds then implanted may be faſt cemented before Froſts return in the Winter. You may Inoculate with the laſt years Buds, which are ſtrong commonly, and fit to be put in at Eaſter.

Other Rules for Inoculation are, That the Cyon from whence you take the Bud be not weak, for then the ſhield will be ſo too, and likely bow or double in the putting in, which is a great reaſon why the double yellow Provence Roſe is ſo hardly propagated by this means; other Roſes, as the Roſa Mundi, Velvet, Marble, and Apples, Aprecotes, and the like, very eaſily; It is alſo required that the Bud be not ſprung out before it be taken off.

If you carry Buds far, expoſe them not to the Sun, but cut off the leaves, or ſome part of them, and wrap them up in wet Moſs or freſh

freſh leaves, to keep them cool.

If the Bud take, in the *March* after cut off all that groweth above it, ſtripping away all the Buds that come forth elſewhere, or at the leaſt all ſave one: ſome conceive one neceſſary for the drawing up the ſap.

Chooſe ſtrong Buds for Inoculation, and ſtrong Cyons for grafting, and put them alwayes on a ſmooth place of the ſtock.

Any thing may be propagated by Inoculation, unleſs the ſlenderneſs and weakneſs of the Shield hinder, that can be by grafting. Apples and Pears, though ſeldome Inoculated, certainly take. I have ſometimes uſed to cut off the ſhield with a ſharp knife flat, with part of the wood thereto adjoyning, and put it in ſo; But this way, though many take, eſpecially in Apples, yet the ordinary way ſeems better and more certain. Some take off Shields without a Quill, ſlipping them off with their fingers; but this is the ready way to leave the root of the Bud behinde on the Cyon, which being wanting, the other part of the Shield is unprofitable.

A pair of Compaſſes made flat at the ends, and ſharp with edges, is an apt Inſtrument to cut away Bark for Inoculation, both for a true breadth and diſtance all at once; and ſo likewiſe with the ſame you may take off the bud truly to fit the ſame place again in the ſtock, Sir *H. P.* p. 113.

Num. 5.

Num. 5. Kirchers *Experiments concerning Insitions examined.*

Kircher, a Learned man, I may call him the *Pliny* of his time, after he had reproved the falsities in *Wecker*, *Alexius*, and *Porta*, who had asserted a change of colours and rare variety of flowers, by steeping those roots in juices whose colours were desired, seems to me as much to be blamed, in that he writes so confidently of things which are so much like Paradoxes, and equally gained by experience.

He says, that he doubts not, but has from experience these effects; That a white Rose, grafted upon a red, will bring that Rosa-Mundi, or a Flower both red and white This I have often prov'd false by mine own tryal: That a Gelsmine grafted on a Broom, will bring yellow flowers like those of the Broom; That I tryed, and could not make to grow, so far it was from bearing any Flowers, *v. Kircher: ars Magn. p.* 13. *c.* 6. But that Jasmine upon Jasmine will grow and thrive, my own and others experience can attest.

The same Doctor, in another Book of his, *De Magnete*, where he has many good Experiments about that Stone, yet as to his φυτομαγνήτισμον either he is out, or there is greater difference betwixt the Country where he tryed his Experiments, and *England*, then I can imagine; I have tryed Mulberies on Beech,

Beech, Quinces, Apples, Pears, Elms, Poplars, and by grafting they would not take, yet he affirms they take easily; and more, that Mulberies are by conjunction with white Poplars, made to be of a white kind, and bear white Mulberies; That Pears being grafted on a Mulbery, bring a red coloured Pear, such I suppose as that which we call the Bloody Pear, and that a Peach being Inoculated on it, it sends forth a bloody Peach, are his assertions, which conjunctions I see will not with us take, but if they would, I could promise my self no greater alteration of colour thereby, then I find in the flowers of Roses, which I have tryed in very many different sorts, and experienc'd to follow the Cyon without any participation of colour from the stock.

I having heard the same relation made of changing the colours of Tulips, by Artificial grafting the Bulbs of the white and red, and other colours, by proportionable indentment in each Bulb, tryed it this year in divers Roots, and made the Insitions, and put together the parts as artificially as I could, according to the rules here given; but the event is, that the Bulbs come not up at all, but die upon the operation.

But I do more wonder that the Curiosity of the learned *Gassendus* should not have found out and rejected the vulgar Errour, namely, that Plums, and other Fruits, may be be made to purge, if the place of the Insition, (*viz.*)

where the graff or Cyon is pack't on, be bored, and the juice of *Scammony*, *Colocynthis*, or *Hellebore*, be shut and peg'd in the hole, and that by the same method any sort of fruit may be made Narcotique, perfumed, or indued by a juice proper for the purpose with any sort of qualities. *V. Gassendum Capite de Facultatibus Plantarum.* But I must do him this right, that he mentions these effects, rather from the Reports of others, then from his own Experiments.

Num. 6. *The manner of growing by Grafts.*

It is prov'd by Experience, that there is every year a new coat of Wood made to every thriving Tree, by apposition of sap hardned into a thin Board (as I may call it) insomuch that I have known divers Woodmen, that would boldly assert the determinate number of years, that any Oke, or other Wood, has thrived in, by the number of those several distinct Rings of Wood that are to be counted from the middle or Center of the Tree, to the outside of it, it being credited, and that I think with reason, that every one of these Rings arose from the apposed and hardned sap of every several year.

Now in grafting upon a firm stock, it comes to pass that the sap of the stock is apposed to the body of the Cyon, and so incloseth the Cyon with the last coat of the whole Tree,

Tree, that there is, as it were, one and the same past of new Wood, that doth closely encompass the whole, both Stock and Cyon, which when hardned, grows to be strong, and of the same use that splinters are to a broken Bone; and Gardiners wisely provide for the strengthning of the compagination of the Cyon and Stock, until this sap be incrusted to a hardness; when the first year of their grafting, they do not only bind up the Cyon to the Stock, but use splinters of old Wood, that neither the winde, or other accidents, may dislocate what with Art is joyned together. This first, for the manner of conjunction and fastning of the Woods: Nor do I make any difference between Grafting and Inoculation, because I am perswaded, that as there is in every Seed an actual Plant, so there is in every Bud an actual Bough, and that a a Cyon and a Bud differ but as a greater and lesser branch.

But how the sap of the Stock (suppose a White Thorn) can serve to make the Wood, Bark, Leaves, and fruit of its Cyon, suppose a Pear, is a difficult question: For grant there be an elective attraction of sap from the earth; yet how shall a white Thorn choose that which is fit for a Pear? My thoughts are, that for those who maintain election of similar parts, it were best to suppose a great likeness in all Grafts and Stocks, as to their inward nature and parts, though not outward

figuration; and there being this likeneſs in the ſubſtance, it will not be hard to conclude, that the Cyon, by altering the poſition of the ſame ſubſtantial parts, may make to the ſight, ſmell, touch, taſte, a thing of another faſhion.

For thoſe qualities that affect the ſenſes vary often in one and the ſame thing: The Apple in the beginning that is without ſmell, of ſowr taſte, green colour, hard to the touch, ſhall in in a little ſpace, be fragrant to the Noſe, ſweet to the Palat, of a golden or ruddy colour, and ſoft to the feeling: And in a thouſand inſtances 'tis found, that ſeveral poſitures of the ſame parts, ſhall produce ſeveral oppoſite colours, and other ſenſible appearances in the ſame things: There is no inherent colour, either in the infuſion of Galls or Vitriol (though limpid they are not) ſo dark or deep, as to come near the blackneſs of Inck, which notwithſtanding, being mixt, they produce. Two other Infuſions of like colour, would not upon mixture ariſe to ſuch an effect, becauſe not able to diſpoſe each others particles into ſuch poſitures. Spirit of Vitriol, though without colour, diſpoſes the parts of this Inck ſo as to deſtroy the blackneſs; Oyl of Tartar reſtores both poſition of parts, and priſtine colour; and that it ariſes from different poſitures, may be argued, becauſe there is a viſible motion ſtriving,

ving, and local mutation in them, before these last effects are produced; and its plain, that when the Inck, by reason of the spirit of Vitriol, disappeared, yet all the parts were there, for else it will not be imaginable how a limpid Liquor, as Oyl of Tartar, should reduce the colours: which it does not by it self generate, as it is plain, because restoring Letters written with Inck, and taken off with Spirit of Vitriol, it makes no blackness on the Paper, save only upon the lines of the Letters: These two limpid Liquors likewise, being put together, turn into a good consistence and milky colour.

But he that desires more instances of this kind and matter, that, according to this Doctrine, may much help the Theory of colours, and particularly the force both of Sulphurous and Volatile, as likewise of Alkalizat and acid salts, and in what particulars Colours likely depend not in their causation from any salt at all, may beg his information from that noble Person, in order to whose command (for all his intimations to me are such) I am now writing, who has some while since honoured me with the sight of his Papers concerning this Subject, containing many excellent Experiments made by his Honour for the elucidation of this Doctrine; or otherwise, for the present, may see very good instances hereof in Doctor *Willis* his Treatise *De Ferment*, *c.* 11. And truly, if Tastes, Colours, Smells, were

not easily alterable, it would not be that we should from the seed of the same Plant attain to such change and variety of Flowers and Fruits as are mentioned above, nor of Flowers from the same off-set.

But if there be supposed in the world, and all several Bodies, but one Element or material Principle, from which, by Natures undescryed Wisdom, in appointing it into several motions and changes of situation, and giving different Measures and Figurations to its smallest Particles, there arise all the varieties in the world; then there will be no difficulty, how the same sort of matter should give substance both to the Stock and Graff, though Plants of different nature, and bearing different Boughs, Leaves, Fruits, Seeds, each from other; for if from any matter, any thing may be made without difference, then particularly the wildest stock may afford Elements fit to nourish the boughs of any Plant, of how gentle and noble nature soever.

But lastly, If all these Considerations be too troublesome, I can help a lazy Naturalist to an admirable expedient for the resolving this appearance; let him be content to believe, that when the Sap, gathered in the root, comes to the place of conjuncture, it is there forc'd to undergoe a total corruption, and lapse into the bed of its first matter, from whence, by a new generation, there arises a new sap, begot in the Tree by a specifick faculty, which

in

in a Pear-graff may be call'd a *Pear-sap-making power*, and so in all the rest: And for the commendation of this last way of Resolution, I must express this is its excellency, that it is equally appliable to all things in the world, each thing being made (and the cause as easily believed) by some such thing-making power.

Or it might not be amiss to entitle *Diva Colchodea*, the *grand-general form-making*-intelligence, to the production of all these effects, and in Romantick guise, to place her, as it were, in a non-erring chair, sitting in the very place of conjuncture of Cyon and Stock, and working by wayes and arts belonging to her own Trade (and therefore, as her proper mysteries, not to be revealed) to the forming in most occult and admirable manner of the appearing effect.

Num. 7. *The Conclusion of this Discourse concerning the five usual wayes of propagation of Vegetables.* Question: *Whether besides these five ordinary wayes, there is yet found out any other certain way for the propagation or raising of any of them.*

And now after my rude and plain way, I have given you the History of the five ordinary wayes of Propagation of Vegetables. The first and most according to Nature, being that which is done by seed: The second by Natural Off-sets. The three last, namely the

Propagation by Stems or Cuttings; by Laying, and by Inſitions, are the more artificial, though Nature gave hints of theſe alſo; which by the Induſtry of the laborious Sons of the firſt Husbandman, and Gardiner (the firſt Man *Adam*) have been at this day thus far improved. What other wayes may hereafter be diſcovered, and particularly what this inquiſitive Age may find belongs rather to the Aſtrologer then to the Hiſtorian, but this I conceive that the conſideration of Vegetable matter ought not to be laid aſide as incapable of further Improvement.

As to that queſtion, whether theſe are all the wayes of Propagation that may be relyed on as real, and without Impoſture, or whether theſe is no way out of the Aſhes or Salts, or other Parts or Principles of Vegetable bodies to produce them otherwiſe then hath been ſpoken. I muſt anſwer with ſome Caution, Firſt that Nature hath private ways of her own to raiſe divers ſorts of Plants without formed ſeed or off-ſet, or the Artiſts help in the wayes newly mentioned. So when ſtones are digged out of a deep Quarry, and Wells are walled with them, there groweth from thoſe walls Liverwort, and ſome ſorts of Adiantum, and ſometimes Umbilicus Veneris, and Moſs, and other Plants which cannot be ſuppoſed to ariſe from ſeed. And ſo likewiſe when grounds, after long Tillage, run again to Ferne or Furze, or Heath or Buſhes,

Buſhes, or Broom or Thiſtles, or the like Plants, it frequently happens that the Production of theſe Plants can hardly be aſcribed to the uſual wayes of Propagation. And therefore in all theſe caſes, we that know no better, have ſtill recourſe to ſeminal Particles latent in the Earth, even from the Creation. For as I have before diſcouſed, It is not improbable that God at the firſt made the Seeds of all things in the firſt Matter. But our queſtion runs not concerning Propagation purely Natural, but concerning that which is artificial or mixt.

Imperfect Plants poſſibly may be contented with other eaſier means. It is experienc'd, that if the water wherein Muſhrooms have been ſteeped or waſhed, be poured forth upon an old hot bed, or if the broken parts of Muſhrooms be ſtrowed thereon, that from theſe parts, as from a ſeed, there will ſpeedily ariſe ſtore of Muſhrooms; but it may be anſwered, either that theſe are imperfect Plants, or this way may be reduced to that which we call'd propagation by Cuttings. The Learned *Kircher* indeed, amongſt other his ſtrange Relations, telleth us, that if we take an Herb, and ſhred it ſmall, or reduce it into Aſhes, theſe Aſhes being ſowed, there will ſpring thence herbs of the ſame Species with thoſe whence Aſhes were made: I can't with good manners to ſo great a Vertuoſo, tell my Reader how little I dare believe this, and

ſome

some other of his Reports. For were this true, it were an ill Custome of our Gardiners and good Housewives, that mingle great store of their ordinary ashes, all made of incinerated Vegetables, with a little of their Garden-seeds to make them go the further, and prevent too great a thickness in the Plants they sow. It were well indeed, if by such mixture they could have a Grove of Okes from Oke Ashes mixt with their seed sprung up in a field of Turneps, or if from the Ashes of Straw they could have a crop of Corn, it were surely a considerable advantage.

It is unquestionable, that in the Ashes of every Vegetable lyeth the fixed Salt. And this Salt is a very considerable constituent part, and very apt to shuit into form, and to give a consistence or solidity to the body it constitutes. But that the Ashes alone should raise a Plant, is countenanc'd neither by Reason, nor Experience. Sir *Kenelm Digby*, giveth us this Experiment. Calcine, saith he, a good quantity of Nettles, Roots, Stalks, and leaves, and in a word, the whole Plant; make a Lye of the Ashes, and filtre the Lye to separate the Salt from the Earth, set this Lye a freezing until it be congealed, and then in the Ice of this congealed Lye; there will be an appearance of abundance of Nettles frozen in the Ice. Onely they will not be green but white, otherwise they will be as like a Naturall throng of Nettles as if they were Painted.

Assoon

Assoon as the water melts, all these Ideal shapes will vanish, and when congealed again, will appear afresh. So Sir *Kenelm*, as he giveth us this report in his little peice concerning the Vegetation of Plants.

I had about a year a go a very good opportunity of trying this Experiment; For being to clear a ground for a Garden that had been long over-run with Nettles, I wanted not a good quantity of the Materials, which having calcined and boyl'd into a strong Lye, and filtrated it according to Art, the success was thus, as it stands in my Diary for *Jan.* 3. 1669. Upon the first Congelation of the Lye, it was not unpleasant to see the variety of Figures struck, some there were like harps, others like dressing Combs; In some places there seem'd the appearance of ruin'd Piatza's, and the Coins of large Windows. *Jan.* 4. I made the Lye stronger, and then on the one side, and end of that side, or face of the Ice, there appear'd as it were a Grove of Trees lopt, or Chapiterless pillars, and on the other end of the same side of the Ice there seem'd to be a rude draught of nine or ten feathers, well and orderly plum'd. Then we took out the cake of Ice, and turn'd it where there appear'd the in figure of a Battel limn'd, with the Images small: And in some parts, the Salt in the Lye had shot into strait lines, five or six of which together, in divers parts, represented a Festoon or Truncheon. Of these there were many,

many, In some places they shot cross with Interstices of plain Ice, which we could Phancy like nothing more then quarters of Wainscote.

In the next freezing there were scarce any figures struck at all, nor in the next following, for the Lye by some contingency was grown confused and thick. That Lye therefore being afterwards filtrated, yet there appeared no Figures on the outside, but turning the Cake, we found, as it were, little thickets of Firre-trees in divers places.

Upon other Congelations afterward, we sometimes thought we saw somewhat like the sorts of Maidenhair, insomuch that at last it became most to our Admiration, that in so much Variety as we had seen, we could not phancy out one formed Nettle.

Mr. *Boyle* in his Essay of Unsucceeding Experiments, reckons those of this Nature deservedly among his contingent ones, where he relates of himself, that having set in Snow and Salt a fine green solution of good Verdigrease to freez, (which Verdigrease containeth much of the Saline part of the Grapes coagulated upon the Copper by them corroded) he obtained an Ice of the same colour, wherein appeared diverse little figures, which were indeed so like to Vines, that he was somewhat surprised at the Experiment. And which increased his wonder, Another part of the same solution being frozen in another Vial,

Vial, by the bare cold of the Air, afforded an Ice angularly figured, not at all like that made by the application of Snow and Salt. And finally, having for tryals sake suffered that Ice wherein the Vines appeared to thaw of it self; and having then frozen the liquor a second time in the same Vial, and after the manner as formerly, he did not discern in the second Ice any thing like that which he admired in the first.

It is more highly Magical that Sir *Kenelm* reports concerning a *Polonian* Doctor, who shewed *Quercetan*, Physitian to King *Henry* the Fourth, a dozen Glasses sealed Hermetically, in each of which there was a different Plant, *viz.* a Rose in one, a Tulip in another, a Gilliflower in a third, and so in the rest. When these Glasses were offered to the first view, there was nothing in them but a heap of Ashes in the bottome to be seen. But assoon as he had held a gentle heat under any of them, presently there arose out of the Ashes the Idea of a flower, (*viz.*) the flower and the stalk of that Plant of which those Ashes were made: And it would shuit up, and spread it self abroad to the just height and dimensions of such a flower, and had a colour and shape answerable. But when ever the heat was drawn from it, as the Glass, and the enclosed Air, and the Matter grew cold, so would the flower sink by little and little, till at length it buried it self in the Ashes. And this

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it would do as often as you expoſed it to Moderate heat, and withdrew it thence; and *Kirker*, as Sir *Kenelm* reports, told him that he alſo had been an Eye witneſs of this Experiment.

But however, this is but a way to raiſe the Idea of a Plant, and not the Plant it ſelf: And if any ſuch way there be, It is yet held in Roſycrucian darkneſs. And therefore we that are not raiſed above the vulgar Phyſiology, are willing to think that what in theſe caſes appear'd, was neither Plant, nor the Idea of a Plant, but only the Phanſy of ſuch Idea.

CHAP.

CHAP. VI.

A Transition leading to a consideration of the wayes of Improvement of Plants raised to Humane use. Of Setting or Transplanting, the Seasons and other Circumstances to be observ'd in these Operations.

HAving now finished our Discourse concerning the Wayes that Nature and Art hath taught us to produce Vegetables, as the next Care is in the Planter, so our next consideration must be how he doth preserve them, and contrive them, that they may continue, and be improv'd to human use. We must learn what hath been found out. First as to Transplantation, then to succor them being Transplanted from all Accidents,

Nec minor est virtus quam quærere parta tueri,
Nor is't less skill or praise,
Thus to preserve, then 'twas to raise.

And

And lastly, to meliorate and Improve: But whatsoever the Art is, I shall not be nigardly in giving you the Rules, which as far as I can remember are these.

First all Trees and Shrubs of woody substance, that have Bodies able to endure the cold, are best Transplanted before the Winter, as soon as the leaves begin to fall by reason of the approach of the Hibernal Cold. It is lately experienced, that a quickset of White-thorn, or any other sorts, Apple-trees, or other Orchard Trees, being Planted before the Winter, far outgrow others of the same kinds that are Planted in the Spring. Nay, even Artichokes, and Asparagus, that are tender Plants, and unable to endure great Colds, yet do exceeding well, being Planted at this Season, if they be set in a rich warm Mould, and well defended in the ensuing Winter from the the violence of the Frosts.

Artichokes are with us commonly set at above an *Ell* distance, and thereby in the Winter a trench being made between the Rowes, the Mould is usually cast up on Rudes over the Rows for the defence of the Roots, together with a good quantity of green Horse-dung mixed with the mould which doth both serve to enrich the ground, and to keep the Plants warm. And if the Artichokes are not so ranck as to cover the space between the Rows, then in the Summer, Coleflowers, or other Garden-stuff, is commonly set in the

Distances.

Distances. For Herbs, and choice Plants, especially those that are set without Roots, it is most fit and usual that they be set in the Spring, as Hysope, Time, Savory, Marjerome, Wall-flowers, Pincks, Gilly-flowers, and Carnations, with this Caution; That by how much more tender each Plant is, in regard of cold, the later it requires to be set, and in the warmer place.

For all Bulbous and Tuberous rooted Plants, it is accounted the best way for their preservation and improvement, that they be taken up every year out of the ground. The Universal and Catholick order of all Bulbous Plants, says *Laurembergius*, is, that about St. *James* tide, they be taken out of the ground, and put in a place cold and dry, of a free air, not in the Sun, nor covered with Sand or Earth, or accessible to Mice; let them abide so a Month, or thereabouts, then set them again, when they are taken up, cut off the Fibres that grow from under the head: nor need any thus take them up every year (unless it be for the transplantation of the off-sets) by which forbearance, the stock of Tulips is very much increased. *Ferrarius* more particularly forbids the abiding of Anemones in the Earth all the Summer, as being found prejudicial to them by his experience. But Fritellaries, and Peonies, and the Crown Imperial, he will not have removed from their Beds, unless into a Cellar, in a pot of Earth.

Nor are all taken up at the same time, as he seems to intimate; for Narcisses and Crocusses are commonly taken up first, generally when the flower is gone, the stalk and leaf withered, and the leaf full, it is the best season to take them up; some keep them out of the ground longer then is above noted, as till Christmass, or after; as this year, being in *London*, my best Tulips, Anemones, and Ranunculus's, were in the House till the beginning of *February*, and yet did well enough: But commonly we re-plant them about Michaelmass, or there abouts: some great Florists keep them out of the ground no longer than till they grow dry; some re-plant them in *June*, some in *July* or *August*; some take not up their Ranunculus Roots at all. Those Gardiners, whose Beds are apt to be overflowed or soaked with cold water in the Winter, (as divers Gardens about *Westminster* are) the later they set, I believe their Bulbous and Tuberous Roots will prove the better.

We here generally remove Fritellaries, Colchcium, or the Medow-Saffrons, all sorts of good Crocus's; Tulips, the bulbous flowers delis, the Gladioli, or Corn-flags, the Ornithogalum, or Star of *Bethlem*; and all Anemonies, and the sorts of Radix Cava, and generally all Plants that loose their fibres, assoon as the stalk is dry, are bettered by taking up; and therefore we may add to the former the Lemoia Bulbosa, and Aconitum Hiemale,

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and some other Plants as capable of this Husbandry, though the hardiness of these Plants may excuse the Gardiner from his pains. Besides the Peonies, and Crowns Imperial, mentioned by *Ferrarius*, divers sorts of *Narcissus*'s, and of the Pseudonarcissi, the Martagons, the Hiacints, and the Ciclamen's, and all others that hold their fibres, will not endure long out of the ground, and therefore the off-sets being taken off are quickly to be re-planted.

Num. 1. *How the Gardiner contriveth the setting of his Plants, and furnishing of his Garden, so as to preserve a continued Beautie in his Garden for every Month in the Year.*

It is not the least Glory of a Garden of Pleasure to be stored with variety of flowers, as to present somewhat of Beauty for every Month in the year. To obtain this, the readiest and most natural way is, to make a collection of such Flowers as will be in actual Flowring of their own Nature every Month in the Year: For there are some flowers as natural to *December*, as others are to *May*, or *June*, or *July*.

In *January*, if the Frosts be not extream, you may have flowers of these Plants, The Christmas flower, or the Helleborus Niger verus, Winter Wolves-bane, or Aconitam

Hyemale, Hepatica, or Noble Liver-wort blew and red, and of Shrubs Laurus Tinus, or wild Bay-tree, and Mesereon, or the dwarf Bay.

In *February* Hepatica's, as also divers sorts of Crocus or Saffron flowers will appear, the little early Summer Fool, or Leucoium bulbosum, and towards the latter end thereof the Vernal Colchicum, the Dogs-tooth Violet, or Dens Caninus, and some Anemones both single and double, which in some places will flower all the Winter long.

In *March* more varieties; for besides that it holdeth some of the flowers of the former Month, it will yield you both the double blew Hepatica, and the white, and the blush single: then also you shall have divers other sorts of Crocus or Saffron flowers, double yellow Daffodills, Oriental Jacinths, and others, the Crown Imperial, divers sorts of early Tulipas, some sorts of *French* Cowslips, both tawny, murry, yellow, and blush, the early Fritillaria or checkerd Daffodil, and some other sorts of early Daffodils, and many sorts of Anemones.

In *April* you may behold all sorts of Auricula Ursi, or Bears-ears, many sorts of Anemones, both single and double, both the sorts of Tulipas, the earlier until the middle of the Month, and the later then beginning; which are of divers colours, that is to say, white, red, black, and yellow: Frittillaries, the Muscari,

or

or Musk-grape flower, both ash-colour and yellow. Divers other sorts of Jacinths and Daffodils, both single and double, the smaller sorts of flower-deluces, the Velvet flower-deluce, and double Hony-suckles, with divers others.

In *May* are to be seen flowring Tulipas (at the beginning) at the end the later sort: some kinds of Daffodils, the Day Lillies, the great white Star-flower, the Flower-deluce of *Constantinople*, or the morning Sable flower, the other sorts of Flower-deluces; single and double white Crow-foot, and single and double red Crow-foot, the glory of a Garden: the early red Martagon, the Persian Lilly, the yellow Martagon, the Gladiolus or Corn-flagge, both white, red, and blush: the double yellow Rose, and some other Roses.

In *June* do flower the white and blush Martagon, the Martagon Imperial, the Mountain Lillies, and other sorts of white and red Lillies, the bulbous Flower-deluces of many sorts, the red flower'd Ladies-bower, the single and double purple flower'd Ladies-bower, the white Springa, or Pipe-tree, for the blew Pipe-tree flowereth earlier, the white and yellow Jasmin.

In *July* some of the Ladies-bower and Jasmines, and besides doth glory in the female, Balsame-Apple, the Indian Cresses, or yellow Larks-spurs, the Purple Flower-gentle, and the Rose-Bay.

In *August* begin some of the Autumne bulbous flowers to appear, as the white and purple Colchicum or Medow Saffron, the Purple Mountain Crocus, or Saffron flower, the little Autumn Leucoium, and Autumne Jacinth, the Italian Starwort, called of some the Purple Marigold, the Mervaile of Peru, or of the world, the flower of the Sun, the great blew Bell-flower, the great double French-Marigold.

In *September* flourisheth the flower of the Sun, the Mervaile of the World, the Purple-Marigold, and blew Bell-flower spoken of before, and likewise the other sorts of Meadow Saffron, and the double kind likewise, the Silver Crocus, the Autumn yellow Daffodil, Cyclamen also or Sowbread shew their flowers in the end of this month.

October also will shew the flowers of Cyclamen, and some of the meadow Saffrons.

In *November*, as also sometimes in the month before, the party coloured Meadow Saffron may be seen, that will longest hold his flower, because it is the latest that sheweth it self, and the Ash coloured mountain Crocus.

December also will not want the true black Hellebore or Christmass flower, and the glorious shew of the Laurus Tinus, or wilde Bay-tree.

I have continued this note of the time of Flowring, though in some particulars differing from the times assign'd for flowring, both

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in Mr. *Rea*, & Mr. *Evelings Kalendarium hortense*, for generally I see no reason to alter it: Mr. *Evelings* are indeed more full, his design being to extend his observation to all kind of flowring Plants, Mr. *Parkinson* his only to those that are for Ornament, esteemed of in a flower Garden: such who desire further satisfaction, and a more comprehensive knowledge in this particular, may have recourse either to the excellent Kalender of Mr. *Eveling*, or to the writings of the experienc'd Mr. *Rea*.

Some I confess there are that value not much a Winter Garden, nor care that their flowers should come too early in the Spring, because they dare not venture into their Gardens to take the pleasure of them before the weather be grown warmer. It is adviseable therefore for them to set the motions of Nature a little backwards, and not to replant their Anemones, Tulips, or other Plants that loose their Fibres, and so will endure out of the grounds too soon.

The ordinary time to Plant Anemones, saith Mr. *Parkinson*, is most commonly in *August*, which will bear Flowers, some peradventure before Winter, but usually in *February*, *March*, and *April*, few or none abiding until *May*: But if you will keep some Roots out of the ground un-planted till *Febr. March*, and *April*, and Plant some at one time, and some at another, you shall have them bear Flowers according to their Planting; those that are plan-

ted in *Febr.* will flower about the middle, or end of *May*, and so the rest accordingly, and thus you have the pleasure of these Plants out of their Seasons, which is not permitted to be enjoyed by any other that I know, Nature not being so prone to be furthered by Art in other things as in this, yet regard is to be had, that in keeping your Anemonies out of the ground for this purpose, you neither keep them too dry nor two moist, for sprouting or rotting; and in planting them, you set them not in too open a Sunny place, but where they may be somewhat shadowed.

The soyl is also to be considered wherein Tulips, Anemones, and these Bulbous and Tuberous roots are planted: A mixture of Sand and Cow-dung, rotted together for many years, is with us generally used, and fresh earth must alwayes be added to the bed when the roots are replanted. *Experimento didicimus*, saith *Ferrarius*, *lib.* 3. *cap.* 7. *in eâ fimosâ terrâ, quæ superiore anno in Anemonarum alitur â fervidioris pinguedinis uber nonnihil emunxerit, Tulipas mirifice adolescere ac magnifice efflorescere. Quin & amœnissimi flores hi maxime lætantur aluntur que ad amœnitatem insolitam eo terræ flore ac polline quem è declivo loco delabens aqua delibat ac devolutum in imò sistit.* We have learn't by Experience, saith he, that Tulips do wonderfully flourish and improve in that mould which the year before hath lost a little of its strength and fatness, by nourishing a bed of Anemones,

as

as also in that fine earth which is carried down from some steep place, by a Land-flood: But we shall speak more of this hereafter, when we shall speak of Melioration, and Improvement by the different Minera of the soyle.

Num. 2. *Of the setting of Woods, Fruit-trees, and Plants uncultivated.*

Concerning Plants that are ordinarily set abroad, and are not cultivated in Gardens or Orchards, few observations can be made that are not very vulgar; It is greatly his interest that minds the thriving of his Trees, that they be set that the Roots may run just under the Turf, in the surface of the Earth, the higher the better, if they are kept moist at the root with wet straw, or the like, and defended from injuries the first year. I have seen some Plants so buried in a depth of thick clay or gravel, that they could not shoot for many years a sprig of a Span long, whereas others set orderly in the same place, did thrive abundantly: And those that think to amend the matter by digging a hole a yard deep, or more, and putting in the Tree with a little good earth, do but cheat themselves; for the Tree would thrive as well upon a Stone-wall, that is washed with rain Water, as in that hole, when once the Root is come to the sides thereof: This I speak generally, and not of such

ſuch particular Trees as delight in a ſingular minera of Earth.

Young and ſmall Plants that are ſet in a light Earth muſt be trod in, and cloſe down to the Roots, leaſt the froſt ſo rarifie the ground as to throw them up again out of the Earth.

And for Orchards, it is a very neceſſary requiſite, that the Roots of Fruit-trees ſtand above the Gravel, Clay, or Rock, if any ſuch be, proviſion for which I have known made two wayes, the uſual and moſt common is, to Plant with ſuch Standards which have no down-right Roots, which may be gotten in any well ordered Nurſeries, for in ſuch, the Seedling Plants are taken up the ſecond year, and the down-right roots being cut off ſhort, they are ſet in beds for grafting, and by this means ſhoot their Root rather in compaſs, then directly downwards. The ſecond way is a more unuſual experiment, (*viz.*) To ſet the Fruit-tree on the top of the ground, without any hole dig'd, and to lay a load of ſuch dirt as is found in ſtreets to the root, upon the Turf; yet ſo, that the rain may abide, and not by reaſon of the banck, run from the root of the new ſet Fruit-tree.

There is a pretty way of Bancking Trees that ſerveth as well for nouriſhment as Fence, ſet down by *Mr. Eveling*, *Pomona. cap.* 7. Set, ſaith he, your Tree on the green ſwarth, or five or ſix inches under it, if the ground be heathy,

heathy, if moist, and weeping half above it, then cut a trench round the tree two foot or more from it: then lay several rancks of turfs upon the inner side of the trench toward the Plant, leaning towards the tree after the manner of a Piramide, fill up the space within the turfs, with turfs cut out of the trench; so raise up the bank near a yard high, at the point it need not be above 2 foot or 18 inches Diameter, where you may leave your earth in the form of a dish to retain the earth, and upon the top prick some small Bryars for an additional defence. I have known in a dry year when Plants thus planted grew and shot well, when others planted the ordinary way, all perished with the dryness of the weather.

For Wall-trees, it is convenient the Roots be set at such a distance from the foundation of the Walls, that they may have room in the Earth for their roots; a foot is a convenient space generally, for then the heads will without difficulty be drawn to the Wall, and the Roots not be prejudiced.

Those Wall-fruits that are set abroad, as Vines, *&c.* being kept short in their Branches, and not suffered to climb, become good bearers, especially if they are set near the reflection of the Gravel-walks, or upon other ground kept bare from Weeds.

Divers persons are very nice in the placing any tree in the same respect to Heaven, I mean to the Sun and Winds, that after the removal of

of it to another place, it may have the same situation it first grew in. This rule Sir *Kenelm Digby* approves of, and gives this reason of its necessity. There is (says he) a constant perpetual course of Atomes drawn by the Sun from the Poles to the Æquator, and such things as lye in their channel, must necessarily be affected with their continually repeated strokes; and that side of them which is exposed to their immediate blows, must be most sensible of them, on the other side, the Sun with his warm and moist regiment of Atomes will work contrariwise, one side of the Plant will be close, hard, and heavy, and be rather acute then perfectly round, the other will be spungy, tender, light, and dilated, having its figure enlarged beyond roundness, so that (says he) if you expose the tender mellow South-side of the Tree, to the sharp hard wedges of the Northern Air, they will so cleave and batter it, that in a short time it will exhale its spirits and die. The truth is, That if the Phenomenon were true, that those that kept Nurseries, and Transplant 5000 in a year without any observation of the North or South, did find their Trees die thereupon, I should think the cause satisfactorily explained. But they finding no such effect (perchance because their grounds are under the wind) I must leave every body to their liberty to observe or neglect this Rule.

For the Planting of Woods in general, for increase

increase of under Wood, Mr. *Blith*'s way is generally approved, to cast up double Ditches, and Plant any sorts of Wood in the form of a Quick-set: Some sow seeds on the Banks in orderly rows, and set likewise on the top, as well as both sides of the Bank. The time is assoon as the Leaf is fallen, in any Weather or Season. The Plants in a more sound ground, are Ash, Oak, Elm, Sycamore, Maples, Crabs, Thorns; in a more moist Ground, as a drained Bog, Poplar, Willow, Sallow, Osier, which grow by Truncheons. In which watery soils, the way of raising Ditches is most necessary: For neither Willow, Sallow, Osier, nor any other Plant, will grow in a Bog, without soundness of ground. What Plants grow by cuttings, what by laying for the more ready thickning of Woods, may be seen above in the proper Chapter.

There is a story freely defended and frequently, both in discourses Printed and spoken, that the chips of Elm, being sowed, will grow; but this is somewhat like *Kirchers* experiments before mentioned, and not a whit more true; otherwise, to sow those Chips, would be a good profitable and frugal way for thickning Woods. The cause of the Country-mans mistake (for I suppose not that this error arose from Philosophers) I imagine to be this: At the felling of great Elms many chips must needs be scattered, and flie round about the Tree, and be covered in the Grass there-

thereabouts; now the next year, after the fall, there arise generally great numbers of Suckers from the roots of the old Tree, which roots must emit all the sap they gather up into these Suckers, the great Trunck being removed. And these Suckers are easily mistaken to arise from the chips, because they alwayes come upon the felling of Elmes where chips are found, and grow at such distance as chips are ordinarily scattered.

Num. 3. *Whether any Vegetables may be set so as to grow in the Air.*

There is a question now-adays frequently proposed, Whether there be more Soils then the ordinary Turf or surface of the Earth, tempered with some water, soyl being meant for the ground, in which things may be set to grow. I need not speak much upon it, as to Water, which by Experiments related in the Chapter concerning Propagation by cuttings, appears to have a property to elicite Roots, and make them where they were not, and nourish the Plants by them after they were made; to which I must adde this circumstance, not before mentioned, that Periwinckle, and divers others, continued their growth by this nourishment alone, from year to year, not dying in the Winter: How long they might have continued, I can't affert, for being absent this Winter, and no fires being kept near;

The

The water in the Glasses, was so rarified by the Frost, that the sides could not contain it, but were forced asunder thereby, and so the Plants perished; whereas otherwise, they being set in a Room over my laboratory, I question not, had many of them continued till now.

Some put forward, that the Air might have the faculty of nourishing Vegetables ascribed to it: And no wonder when *Paracelsus* makes it a sufficient nourishment for men, and brings instances for the proof of his assertion. But I find, that Onyons, Tulips, and all Bulbous Roots, though they shoot out a green leaf, yet do very much lessen in their weight. And it appears, that this growth is but the motion of the same parts, or some few of them, to settle and gather in another place, and another order or scituation in relation to each other; for the Onion particularly hath the thicker coverings of the Bulb very much stretched out, and each covering, as it increaseth in length and breadth, by rising into a leaf, so the thickness, which was considerable while it covered the Bulb only, decreaseth proportionably, and is fashioned into a thinner, and more largely extended Vestment.

I have hung up divers *Sedums*, *Orpines*, *Tithymalls*, and other such Plants, which I imagined most likely to grow by the Air onely, and to encrease and be augmented thereby, and found, that by all my endeavours, though the

the Plant grew well, yet they alwayes loſt weight, and never got the fourth part of a grain.

Aloes likewiſe, though being hang'd up in the Air within cloath dipped in Sallat Oyl, it ſends forth for many years new leaves, yet it alwayes grows leſs, and leſs in weight, till at laſt the oldeſt leaves falling off, and new coming up, it grows to nothing.

CHAP.

CHAP. VII.

Of the means for the Improvement and beſt culture of Corn, Graſs, and other Vegetables belonging to Husbandry; and of the ways for removing the ſeveral annoyances that uſually hinder ſuch advantage.

Num. 1. *Of the Annoyances to Land, and the Impediments that uſually diſtemper it, to the diſadvantage of the Husbandman.*

THe Impediments that with us hinder the Husbandmen from making the greateſt advantage of their ground, are either the diſtempers of the ground it ſelf, or ſome evil accidents that occaſionally happen thereto, or to the Vegetables growing thereon. The diſtempers are generally cauſed, either by the abounding of water above all other Principles, which cauſes coldneſs, and a Dropſical diſpoſition in the Earth; or by the abounding of a dry Earth or Mineral,

and the want of moiſture and ſaltneſs, and that Spirit which ſhould cauſe that motion in the inſenſible particles of the Earth, which is proper for the exciting the Seeds of all things, and ſo ſtirring the ground, that the ſeveral particles may be at liberty to enter the Bodies of Vegetables fit for them. The accidents that are occaſional come by blaſting Winds, rapacious Fowls, Vermine, and Weeds, Fearn, Heath, Broom, and other unprofitable Vegetables; Of theſe, and the uſual remedies againſt them, ſomewhat, and the beſt that at the preſent occurs, I ſhall ſpeak in this Chapter.

Num. 2. *Of the Remedies proper to cure the exceſſive coldneſs and moiſture in Lands, and the wayes of Improvement thereby, in Grounds ſubject to theſe diſtempers, by dreining, Pigeons and Poultry dung, Urine, Soot, Aſhes, Horſe and Sheep-dung: of Ground cold and dry, and how theſe Soyls may be applyable thereto.*

Bogginеſs and Obſtruction of Springs more or leſs, is generally the cauſe of the chill or coldneſs that lies upon Lands, and breeds the Ruſh and other incommodities, and therefore the foundation of the cure, and improvement thereby, muſt be to remove this internal cauſe, by laying the ground dry, and dreining the Bog: In the relation of which operation, and many more of this Chapter, I ſhall eaſe my ſelf,

ſelf, by giving you *Mr. Blths* obſervations and directions thereabouts, who was both a Practiſer himſelf, and queſtionleſs a very faithfull and true Reporter of his experience.

In cold, ruſhy land, ſays he, the moiſture, or cold hungry water, is found between the firſt and ſecond ſwarth of the Land; and then oft-times you come immediately unto a little Gravel, or Stonyneſs, in which this water is, and ſometimes below this, is an hungry Gravel, and many times this Gravel or Stonyneſs lieth lower: But in Boggy Land it uſually lieth deeper then in ruſhy; but to the bottom, where the ſpewing Spring lyeth, you muſt go, and one ſpades depth, or graft beneath, how deep ſoever it be, if you will drain the Land to purpoſe.

And for the matter or Bog-maker, That is moſt eaſily diſcovered, for ſometimes it lieth within two foot of the top of the ground, and ſometimes, and very uſually within three or four foot. Yet ſome lie far deeper, ſix, eight, or nine foot, and all theſe are feazable to be wrought, and the Bog to be diſcovered; but until thou come paſt the black Earth, or Turf, which uſually is two or three foot thick, unto another ſort of Earth, and ſometimes unto old wood and Trees, (I mean the proportion and form thereof, but the nature is turned as ſoft and tender as the Earth it ſelf) which have lain there no man knows how long; and then to a white Earth many

times, like Lime, which the Tanner and white Tawer takes out of their Lime-pits, and then to a Gravel or Sand where the water lieth, and then one Spades depth clearly under this, which is indeed nothing elſe but a Spring, that would fain burſt forth at ſome certaine place, which if it did clearly break out, and run quick and lively, as other Springs do, your Bog would die, but being held down by the power and weight of the Earth, that oppoſeth the Spring, which boils and works up into the Earth, as it were, blows it up, and filleth the earth with wind, as I may call it, and makes it ſwell and riſe like a Puff-Ball, as ſeldom or never you ſhall find any Bog, but it lyeth higher, and riſing from the adjacent Land to it, ſo that I believe, could you poſſibly light of the very place where the Spring naturally lyeth, you need but open that very place to your Quick-ſpring, and give it a clear vent, and certainly your Bog would decay; by reaſon whereof, it hath ſo corrupted and ſwoln the Earth, as a Dropſie doth Mans Body; for if you obſerve the mould, it is very light and hollow, and three foot ſquare thereof, is not above the weight of one ſolid foot of natural Earth, Clay, or Land, whereby I conceive, that how much ſoever this mould is forced from the natural weight or hardneſs of ſolid Earth or Clay, ſo much it is corrupted, ſwoln, or increaſed and blown up, and ſo much it muſt be taken down, or let forth,

forth, before ever it be reduced; I therefore prescribe this direction: Go to the bottome of the Bog, and there make a Trench in the sound ground, or else in some old Ditch, so low as you verily conceive your self assuredly under the level of the Spring or spewing water, and then carry up your Trench into your Bog straight through the middle of it, one foot under the Spring or spewing water, upon your level, unless it rise higher; as many times the Water or Spring riseth, as the Land riseth, and sometimes lyeth very level unto the head of the Bog, unto which you must carry your Drain, or within two or three yards of the very head of it, and then strike another Trench overthwart the very head both ways, from that middle Trench, as far as your Bog goeth, all along to the very end of it, still continuing one foot at least under the same, and possibly this may work a strange change in the ground of it self, without any more Trenching.

Or thus you may work it somewhat a more certain way, but more chargeable, (*viz.*) after you have brought a Trench to the bottom of the Bog, then cut a good substantial Trench about the Bog, I mean, according to the form of your Bog, whether round, square, or long, or three or four yards within your Boggy ground; for so far, I do verily believe, it will drain that which you leave without your Trench, at the depth aforesaid, that is under-

neath the Spring-water round; And when you have ſo done, make one work or two juſt overthwart it, upwards and downwards, all under the matter of the Bog, as is aforeſaid, and in one years patience, through Gods bleſſing, expect your deſired Iſſue: And if it be in ſuch a place as will occaſion great danger to your Cattle; then having wrought your works and drains as aforeſaid, all upon ſtraight lines (by all means prevent as many Angles, Crooks and Turnings, as is poſſible, for thoſe will occaſion but ſtoppages of the Water, and filling up of Trenches, and loſs of ground, and much more trouble then otherwiſe.) Then you muſt take good green Faggots, Willow, Alder, Elm, or Thorn, and lay in the bottom of your Works, then take your Turf you took up in the top of your Trench, and plant them thereupon with the Soard downward, and then fill up your works level again, until you come to the bottom or nether end of your work, where your Trench is ſo ſhallow, that it will not endanger your Cattle; or rather take great pibble Stones, or Flint Stones, and ſo fill up the bottom of your Trench, about fifteen Inches high, and take your Turf, and Plant it as aforeſaid, being cut very fit for your Trench, that it may lie cloſe as it is laid down; and then having covered it all over with Earth, and made it even as the other ground, wait and expect a wonderful effect, through the bleſſing of God;

God; but if you may, without eminent danger, leave your works open, that is most certain of all.

For other sorts of cold land that are sound, and not spongy, or Dropsical, the wayes to make them useful to the Husbandman or Grazier, is to meliorate them by adding to the cold and moist some store of the more hot and active Principles, such as abound in those bodies that are reckoned to have much spirit or volatile salt in them: such as are Hen-dung, Pidgeons-dung, Soot, and the like, to which Malt-dust may be added, but is then most useful when impregnated with these Dungs. For there is some of the spirit of the fermented Barly in the Malt-dust, with which the Earth is disposed to such a fermentation as is proper to make it fruitful in the production of Vegetables. Yet that spirit is so subtile, that in a dry time it soon exhales, and therefore in a dry year worketh not so great an Improvement as in a wet one: For this Malt-dust our Husbandmen give twelve pence the Bushel, which they generally, where they have the conveniency, spread in a Dove-house (else in a Hen-house well stored) that the Pidgeons may pick it, and further enliven it with their heat and vertue of their dung before they sow it: For all these powerful Medicines are to be bestowed in small quantities, and therefore sowed by the hand, for fear of burning the chits, and killing the corn

in its first Germination. I have observed that where these Dungs have been over plentifully laid, that the place bare no Corn at all, whereas in the same place where it is moderately strewed, there was a vast improvement of the Crop. Urine is esteemed a great help to cold Land from the same principle, and therefore the same Caution is to be used that the parts of it be disseminated, and not laid too thick. I have seen half the Trees in a Codling hedge killed by watering them too much with Urine.

And the Improvement is full as great in cold and moist Pastures and Meadows as on plowed Lands, both by *Malt* dust and the mentioned dungs. I have seen an Experiment made of divers of these together on several parts of the same ground, where it appeared that the Improvement was greatest by Soot; the second place had Pidgeons dung.

After those above mentioned, *Horse* dung hath a place by reason of its heat, but if not rotten, and laid too thick, may do harm also; but that rather by an actual, then by a vertual heat, or the power of single principles, as in the former instances. This is sure, that if it be laid on so thick and green as to heat, it will burn the roots of any ordinary Vegetables that grow near it. Sheep-dung, Hog-dung likewise, and all Soyl and Litters of Cattle, by reason of their Dung, Urine, and the heat of their Bodies, lying thereon, have a warmth

in

in them, and are fit for cold Lands on that account; and by reason of their moisture, for dry Lands also. For it is to be observed, that many Grounds are dry and cold too, in all parts of the North and North-west, and in *England* many of our Wood-lands especially; and so all hot and moist soils are most proper for them. Burning and beaking is in many places very successfully used to this effect; The actual fire heating the ground, and the ashes of Fern, Brake, Heath, &c. of like nature, yielding a Salt very profitable for, and expedient to joyn with the other Principles in the ground, to cause a fermentation and fruitfulness. Of this Operation thus *Virg. Geo.* 1.

Sæpe etiam steriles incendere profuit agros,
Atq; levem stipulam crepitantibus urere flammis:
Sive inde occultas vires & pabula terræ
Pinguia concipiunt; sive illis omne per Ignem
Excoquitur Vitium, atq; exudat inutilis Humor:
Seu plures calor ille vias & cæca relaxat
Spiramenta, novas veniat qua succus in Herbas.

From burning steril plains oft plenty comes,
Whilst the dry stubble cracking fire consumes:
Whether this Heat from th' Earths recruited (Veins
All vitious and superfluous Moysture dreins,
Or 't may be, secret passages doth ope,
To let in sap, to feed the tender Crop.

It

It is a general rule, that there is nothing in animal Bodies, but will turn to excellent Manure: Their Horns, Bones, Hair, Flesh, both of Beasts, Fish, and Fowl, are very rich; and those that know the vertue of them, buy at Cities for the purpose, rags which are made of Wool, Sheep-trotters, stinking Fish, or other Offal of Animals, which must either be mixed with other dung, or not laid over thick.

But it is to be observed, That where moisture is rather required then heat, there floating by Land-Floods, the dirt and mud of Ponds and High-ways is most proper: where warmth and heat is a greater need; there soyl that is made by a mixture of the Offal of Animals, will be more to the purpose, and advantage of the Husbandman.

Lastly, 'Tis probable that any thing that has active parts in it, if it be not just of the nature of the ground, will raise improvement: Heterogeneous things upon their meeting, ordinarily causing that stir, which is thought by most Naturalists now, to have great influence upon Vegetation.

Num. 3. *The wayes of Improvement of dry, light, sandy, gravelly, flinty Lands, by floating, Marl, Chalk, Lime, and Salt-Peter, S. K. Digby's experiments of its advantage.*

Dryness is generally a great cause of barrenness, and is an usual annoyance in Sandy and Gravelly

Gravelly grounds, more especially, in regard that they retain not the rain-water so well as clay, or Land of a mixt soil: The proper remedy for this defect, is artificial watering, which tempers the ground most properly for the improvement of the growth of the most useful Plants, Grain and Grass: For first, water in its own nature and property is a soyl, and has an exceeding agreeableness with the bodies of most Vegetables, as appears by the experiments of their growth in water onely. And secondly, there is a very considerable accruement to dry, sandy, and gravelly Earth, by the fatty soyl and wash that is carried both in Land-floods, and other Water, that having passed through Cities, Roads, or other places of like nature, are drawn over the ground, for the salt oyly parts, and other the mixt earth, that was carried in the Flood, is left generally behind upon the Land; and the salt dilated in the Water, easily enters the Turf, and carries with it other Particles thither, where, by the heat of the Sun, (they being in conjunction with the Sand, Gravel, or other Bodies Heterogeneous, and unlike to themselves) they cause by their mutual fermentation, as is supposed, or some other way, that temper of gound which is most fit for the growth of all Grain, Grasses, and other Vegetables of general use.

Nor are Land-floods the onely Watering, for Springs that arise from any improving Minera,

Minera, carry with their water many improving Particles: I remember particularly that I was informed by an excellent person, and practis'd Waterer that he had observ'd in some lands of his own, that his Improvement made by floating with the water, that came immediately from chalk springs was very considerable to him, nor much inferiour to Land-floods.

For drawing the water over Land, the use is, that by the eye or *level* which is easily made to help the eye, First, Discovery be made where the water may be conveighed over the most Land: Then *Mr. Blith* advises, to cut out the Master Trench or Water-course, to such a bigness, as may contain all the Land-flood, or at least, be able to bring it within the Land intended for this improvement: When the water is brought thither, carry it along in a foot broad Trench, or lesser, all along the *level*: If the level be too dead, the lesser stream will follow, so that a convenient descent must be minded, to give the water a fair passage. If there be discovered in this lesser Trench, any mistake or failing, it may with ease be amended, by going higher to, or lower from the level, and the first Trench be stopt up again, for this Trench need be no deeper then the thickness of the upper Turf: This done, the Water-course must be cut out, which must be large enough to contain the whole Water which is intended for the enrichment

ment of the Land, which largeneſs ought to conſiſt in breadth, and not in deepneſs, for a ſhallow Trench, about a foot deep, is beſt for this work: When the Trench is brought near to the end of the Land, it is to be drawn narrower and narrower.

Further directions the Author gives the Improver, in theſe words.

As ſoon, ſayes he, as thou haſt brought the Water upon the Land, and turned it over, or upon it, be ſure thou take it off as ſpeedily as poſſibly, and ſo fail not to cut thy work; ſo as unleſs thy Land be very ſound, and thy Land-flood very rich, thou muſt take it off the ſooner by a deep draining Trench. Therefore I preſcribe no certain breadth, betwixt floating and draining Trenches; but if the Land be ſounder and dryer, or lieth more deſcending, thou maiſt let it run the broader; and as the Land is moiſt, ſad, ruſhy, or level, let it run the leſſer breadth or compaſs; and for the draining Trench, it muſt be made ſo deep, that it go to the bottome of the cold, ſpewing, moiſt Water, that feeds the Flag and Ruſh; for the wideneſs of it, uſe thine own liberty, but be ſure to make it ſo wide, as thou maiſt go to the bottom of it, which muſt be ſo low as any moiſture lieth under the upper and ſecond ſwarth of the Earth, in ſome Gravel or Sand, or elſe where ſome greater Stones are mixed with Clay, under which thou muſt go half one Spades graft deep at the leaſt:

Yea,

Yea, ſuppoſe the corruption that feeds and nouriſheth the Ruſh or Flag, ſhould be a yard or four foot deep, to the bottome of it thou muſt go, if ever thou wilt drain it to the purpoſe, or make the utmoſt advantage of either floating or draining, without which, thy Water cannot have its kindly operation. The truth is, otherwiſe the benefit might happen to be no greater then the Patients, who incurr'd a Dropſie in his cure from a Feaver: whereas by this means there is a double benefit, the firſt whereof comes by the commodity of watering, the ſecond, by the dreining Trenches neceſſarily annexed thereunto. But whereas the aforeſaid Author commends watering or floating, as an help to boggy, ruſhy, quagmiry Land. I ſuppoſe no benefit, but hurt would ariſe thereby to ſuch Lands, if theſe dreining Trenches did not open the paſſages of the obſtructed Springs original cauſes of the Bog or Ruſhineſs, as well as let out the Water newly introduced by the floating.

The time of the operation for this improvement, muſt be when the Graſs is all off the ground, for elſe the ſoyl will ſtain it that comes along with the Flood: Often watering is good, but to keep it long in a place, breeds the Ruſh.

For this operation therefore, theſe are ſpecial Rules, To begin your work betimes in the year; aſſoon as the graſs has done growing,

ing, and is eaten off, That the ſtream or float that runs over the graſs be as ſhallow as poſſible, and the water continue its running; It muſt be no deeper than the ſhort graſs which muſt ſtrein the water as it floats, for elſe the hungry water may lie ſtill at the roots of the Graſs, and the fat run over it; Likewiſe it is to be provided, that by reaſon of the unevenneſs of the ground, the water ſtand not, nor reſtagnat as in a pool on any part of the ground, for the ſame reaſon, becauſe the Land-flood then would paſs along upon a level of reſtagnant Water, and would not touch the turf or graſs which ought to entertaine, and ſtay, and arreſt the richneſs, and fat of it. By this very Husbandry, Mr. *Blith* brings precedents of Improvement of Land, from Eighteen pence, to Thirty ſhillings an Acre; and Mr. *Plat*, from One ſhilling to Five pounds.

Virgil mentions this watering, as an Improvement practicable upon land ſowed with Corn, which is not ordinarily practiſed in *England*, though I ſuppoſe it might be in ſome places uſed with very good ſucceſs.

Quid dicam, jacto qui ſemine cominus arva
Inſequitur, cumuloſque ruit male pinguis arenæ
Deinde ſatis fluvium inducit, rivoſque ſequentes,
Et cum exuſtus Ager morientibus æſtuat herbis,
Ecce ſupercilio clivoſi tramitis Undam
Elicit, illa cadens, raucum per levia murmur
Saxa ciet, ſcatebriſque arentia temperat Arva.

What

What shall I say of him, hath sowed his Land,
Then streight goes on, casts heaps of barren sand,
And streams to his Corn in flowing Rivers turns,
And when scorch'd fields with dying herbage burns
From rising ground conducts a chrystal lake;
Which 'mongst smooth stones doth gentle murmur make,
And bubling forth, refresh the parched field.

Another Remedy for dry and light ground, such as abounds in sand and gravel, is *Marl*, an earth most commonly slippery or greasy to the touch. Of this denomination there are divers kinds, and those of different Natures, for colour, some are blew, some grey, some yellow, some red, some hard and stony, some soft and mellow. But if fit for improvement, it must be alwayes friable, so as to slack after Rain, and never again apt to return to it pristine cruſtiness and consistence, but rather to resolve it self further and further into dust and pouder.

Most sorts of Marl sadden naturally, so as to make Ry-land fit for Wheat, Barly, and Peaſe, and therefore must not be used twice or thrice together, without some other more natural Compost, such as our ordinary Dungs are. It is a ruled case, that whosoever layes down any Marled land from Tillage to Pasture, must first well Dung it.

But still Chalk is to be preferred before most sorts of Marl, both for its sureness and readiness,

readineſs, and is ſuitable to all ſoyls unleſs Chalk it ſelf; It improves upon Clay eſpecially, but upon Sand and Gravel alſo upon the firſt breaking up, and ſowing grounds for Corn. And the Improvement thereby is ſo great, that Husbandmen in divers places fetch it three or four miles in Carts for their Uſe, and yet it is a great queſtion, by what Principle it improves, whether by communicating any particular fatneſs, or other meliorating parts, or which is rather believed, by Mechanically ſerving to thoſe motions that aſſiſt thoſe little fermentations that are neceſſary, and by hindring the ground from ſetling into its old Conſtitution by its continual mouldring and friability.

The general proportion of Chalk for an Acre, is from 40 load to fifty or 60. Clay requireth the greateſt proportion. In the *Iſle of Wight*, they uſe a ſtony concrete of a Marly nature, that moulders not ſo faſt, as Chalk, and therefore they are forced to apply a double proportion, uſing ſometimes above a hundred load upon an Acre.

It is *Mr. Bliths* obſervation concerning lime, that it is a ſuitabler manure for light, ſandy earth, then for a wet and cold gravel, but for a cold hungry clay worſt of all. For lime being once ſlacked doth ſadden exceedingly, contrary to its nature in the ſtone, and ſo it turns light land into a ſtate able to bear good Wheat. About 12 or 14 quarters of Lime

ſerves an Acre, for Ground may as well be over as under limed, after liming, till your Improvement not long, but turn it again to paſture.

I have ſometimes thought the reaſon why Lime agrees not with Clay ſoyl, to be this, becauſe Lime draws moiſture abundantly; every one that uſeth it, obſerves that if it lyeth in the Air, it will quickly draw moiſture enough to ſlack it ſelf in the heap. And moyſture binds Clay above meaſure. It hath been obſerved in ſome Clay ſoyls, where I have had occaſion to Travail, that a Glut of Rain faſtens their field ground. It being not ſuddenly trod in, and mixt, and taketh away the rottenneſs of it, and bindeth it beyond what a man that is a ſtranger to it would reaſonably believe.

Having mentioned ſo many others, I muſt not paſs by the Obſervations of Sir *Kenelme Digby* concerning the improvement of Salt-Peter, which he giveth us in his Hiſtory of the Vegetation of Plants.

By the help, ſaith he, of plain Salt-Peter, diluted in Water, and other fit earthly ſubſtance that may familiarize it a little with the Corn, I have made the barreneſt ground far outgo the richeſt in giving a plentiful Harveſt; I have ſeen Hemp-ſeed ſoaked in this liquor, that hath in the due time made ſuch Plants ariſe, as for the tallneſs and hardneſs of them, ſeemed rather to be Coppice wood

of

of fourteen years growth at leaſt then plain Hemp. The Fathers of the Chriſtian Doctrine at *Paris* do ſtill keep by them for a Monument a plant of Barly conſiſting of 249 ſtalks, ſpringing from one root or grain, in which they counted above 18000 grains of Barly. Nor is it barely the Salt-Peter imbibed in the Seed or Root that cauſeth this fertility, No, that would be ſoon exhauſted, and could not furniſh matter to ſo vaſte a progeny. The Salt-Peter there is like a Magnes which attracteth a like Salt that fecundateth the Air; For as the Coſmopolite ſayes, there is in the Air a hidden food of Life. This Spirit then that is in the Air, is drawn as it were by a Load-ſtone by the ſaline liquor that is imbibed into the ſeed. In a Villa at *Rome* I ſowed ſome Barly thus prepared, and what with the Dew, and what with the Air, and what with the Sun, I ſhould in the morning, by then the Sun-beams had dryed up the ſuperfluous moiſture, ſee ſproutings up of a pure Salt-Peter of a prodigious height all about, and over the ſeeds that lay ſlightly covered with the looſe mould. They would be above an Inch, nay two Inches long of the pureſt Chryſtalline Salt-Peter that could be ſeen. And it is upon this Principle, that the Pope in his ſtate, and the old Duke of *Bavaria* in his, did firſt make, and then nouriſh Mines of Salt-Peter; whoſe Roots and Quarries are far different from other Minerals, for they are un-

derfoot in the Earth, and these over our heads in the Air. This is a pure extract drawn by the Sun-beams from all the Bodies that he darteth his Rayes upon, and sublimed up to such a height of place as leaveth all feculence behind it; and is there in that exalted Region baked, and incorporated with these very beams themselves which did refine this extract out of its drossy Oare. And it appears by the Antient Georgicks, that the use of the steeping the seed in Salt-peter is no new invention,

Semina vidi equidem multos medicare serentes,
Et nitro prius, & nigra perfundere amurcâ,
Grandior ut fætus siliquis fallacibus esset,
Et quamvis igni exiguo properata maderent.
Virgil Georg. 1.

I have seen many to anoint their Seed
With Nitre first, then lees of Oyle to spread.
Whence larger Grain the empty husks did fill,
Which with soft heat did into ripeness swell.

Num. 4. *Remedies for accidental annoyances and hindrances of Improvement, particularly the ways to destroy Fern, Heath, Ant-hills, Moss, Rushes, Rest-harrow, Broom, or any such Weed or Shrubs that infect the ground: Whether liming of Corn prevents blasting, the effects of that and Brine in Improvement: Concerning Moles, and the ways to destroy them or drown them; Of Antipathy, as to this effect, in Animals and Vegetables to the Bodies of their own kind, when they are in the way of*

of Corruption: Mr. Blith's *way of preserving Corn from Crows, Rooks,* &c.

When any Land runs to Fern, Heath, or Ant-hills, Mossiness, Rushes, Coldness, or any other Weeds or Shrubs, as Goss, Broom, Furz, &c. The most proper and improving remedy, is, to plow it three or four year, and then lay it down in good heart. In which operation, care must be had to Plow up the Weeds clean, and burn the Roots of them in heaps, which warms the ground, and to give it convenient dunging every year, for so the greater shall the improvement be. This Land must be cast into Furlongs, that the Furrows may convey the Water one to another into a general Trench, that it lie not upon the Land.

If the Land be cold and moist, lay it the higher on ridges; if hot and dry, sandy, or the like, let it lie flat, that it may better retain the Rain water.

Be sure you Plow up the Rushes, Brakes, or other annoying Weeds, and for fail, let some body with a Spade, follow the Plough, to root up such as are left after the Culter and Plow-share.

Harrow this new broken ground, with weighty, sharp, and long tined Harrows, such as 'tis a Teems work to draw, that uneven places may be torn up, and good store of mould raised. Cover your Seed with two or three sorts of Harrows, each Harrow having

times thicker then the other: ſome put weights upon the Harrows in the firſt, and a Thorn under them in the laſt operation.

After four years Tilth, lay down your Land, and that upon a Crop of Wheat or Rye, not on a Summer Corn, for ſo the Soard will come the ſooner, eſpecially if the Crop be ſowed thin, and as early as may be: If you will double or treble the Improvement, the Husbandry of ſowing Clover-graſs, ſpoken of in the firſt Chapter, will here come in moſt properly. In this laſt Plowing, regard that the Ground be laid down ſmooth, yet on ridges if the Land be cold, and unleſs the Land be of exceeding ſtrength, fail not to manure it by dung, or otherwiſe, this laſt ſeaſon of plowing.

Mr. *Blith* reports, and Mr. *Hartlip* likewiſe, That the natural helps to preſerve Corn from blaſting, is the ſteeping of it in thick fat water, or Lime-water, Urine or Brine, or the mixing of Lime or Aſhes, with Corn well wet and moiſt, that ſo it may cloath it ſelf with the fineſt of the Lime or Aſhes, &c. ſo as it may fall cloathed all over to the Earth, and ſo be covered therewith: But I believe he was miſtaken in the applying of the Medicine to the prevention of the right and proper diſeaſe: I have heard ſuch who practiſed theſe Medicines, affirm, that they have generally, and with reaſonable good ſucceſs, uſed thoſe remedies to prevent ſmootineſs; but the very laſt

last year it was observed, that where those means were used, the blast did as much harm, as on the adjoyning Lands where there were no such Applications made to the Seed. And blasting being the perishing of the tender Kernel, by reason of a Wind (which from effect is sometimes called a red Wind) that too sharply, and it may be with some Venome breaths on it at its first beginning; I see no reason that such infusions or applications should be any defence, for it comes from an outward violence, and therefore it is most usually seen, that not half a Tree onely, but half a bough shall be blasted, while the other half of the same, that grows by one and the same nourishment, remains free, sound, and well coloured.

And the like may be said of Mildew, that it is not to be prevented by Liming or Brining, or any the like means. It is a good account of the Cause and Cure of this Accident that is delivered by Mr. *Remnant* lib. 2. cap. 1. Mildew (saith he) is a fine thin, sweet dew when it falleth, no dew or water in the Earth is so thin as I know of; yet if it lye till the Sun or heat come upon it, or winds dry it, then it becomes clammy stiff and binding; but the worst effect that it hath is upon Wheat and Hops.

It falls commonly in the warmest and stillest weather, it is exhaled or drawn up by the Sun out of the flowers, and from sweet things

or sweet places of the Earth, and it is most frequent in the height of Summer, and warm weather, especially a little before Wheat Harvest: so that Wheat is taken by it when it is full Corn in the Ear, and the straw is dry, and beginning to change white. It falleth sometimes in the Night, sometimes in the Day, but most of all in cloudy, misty, gloomy weather. The which to find out, keep Bees, and they will be your Intelligencers.

If it fall in the night, they will out to gather as soon as day is light; or if it fall by day, they will abroad together though it fall fast, and as big as a pretty raine. Therefore when you see them fly thus early and diligently, be sure there is a sweet dew fallen, then make haste before the Sun or dryness cometh on it, and get help, and away into your Wheat, and with a Line or Rope run over your Wheat, as fast as may be one in one furrow, and another in another furrow, a Land two or three distance, as you can well reach, one at one end, and the other at the other end of the Rope or Pole; and the least touch or wagging will shake it off, it is so exceeding thin when it is new fallen; yet if you have time and help, it were good that you went backward as well as forward to make sure work. But if you let the Dew alone, it will stick fast when heat or dryness cometh on it, and so in time will set your Wheat, so that no moisture or nourishment

can

can come out of the Root into the Ear, and then your Corn shrinks in the Ear for want of nourishment.

This Dew will in time stick fast, and become clammy, and bind like Turpentine or Birdlime; first straked on the straw, and within a while all black over, and round about the straw, while the Wheat is green, and that there is no moisture in the straw so long the mildew doth no hurt; so likewise when the Corn is hard, and dead ripe in the Ear, it is past danger: so that the greatest hurt is done between the time that it begineth to change colour, and the full ripening; and if you be careless and negligent in this time, be sure your Wheat will be dryed up with the Sun, and shrunk in the eare, and blasted, which by Gods blessing, and your small pains and diligence, you may prevent. Some have slighted and contemned this weak means for a while, but after better consideration, have made use of it, and found the profit and benefit, and were thankful for it.

The Mildew is also to be perceived upon the Oak leaves shining and sweet, but having your *intelligencers* at home, you need not seek abroad.

Concerning the blasting by Wind, and cold or hot Aire, it is not very frequent in our Countrey thanks be to God; yet Rye and Fruit is sometimes blasted by some of these, and hops very often by the Mildew. When therefore this Dew falleth, shake your Hop poles,

poles, and with a gentle Wand beat of this Dew from the leaves, and if it be not too much labour, wash it off also by throwing water, if you see that it will not come off with shaking: For if it stick on, and continue, you shall see Worms and bobs Breed, and stick there, and so spoil your Hops, and they will be lowsy and filthy, and much impaired if not all lost. Now, if you be diligent and watchful herein, you may by Gods blessing, receive double, and trebble, or greater recompence of your pains, and preserve abundance which the former Ages have lost.

The same Author in the 3d Chapter, speaks thus concerning the Cause and Remedy of smutty Wheat: We see (saith he) that most will make choice of the faireſt, freeſt, plumpeſt, and weightieſt Wheat for Seed, and they think that they do well in it; but observe it better, and make other tryals of it, and see what will come of it. Is the fatteſt Oxe or Cow the beſt to keep? But to instance in my own Element, do the fatteſt stacks of Bees prove better or the most fruitful? No surely, I find that good midling stocks, that are mending, prove beſt and swarm ofteneſt; and the very fat ones, prove leaner, and sometimes die, but seldome swarm. So take it to be in this case; when Wheat is at the beſt, it doth soon decay, and become worse, yea naught, and worse then naught. You shall see it come up in great plenty, blades enough, and straw enough,

enough, and shoots the Eare, and hath its Corn in the Ear; but suddainly it perisheth, and dieth in the Eare, and becometh naught, vile dust, worse then the earth, and of no use, putrified, dead and gone. You may see it at a stand, and dead in the Eare, the Eare gaping and staring, much differing from the other that hath life and vigour in it. And if the Land be not in very good heart, much of your VVheat will be thus spoyled, and the more comes up, the greater bulk, the more will perish, and become black, and will soyle all your good Wheat in the threshing, and will make it black at the ends: and it hath a damp and faintish smell with it, and I think is not wholsesome to eat; therefore pick or lease it out of the sheaf before you thresh it, or you had need wash it well, and dry it after it is threshed, before you eat it. Therefore when your wheat is very fair, plump, and weighty, use that rather to spend in your house, for it yields more, and better flowre; but for seed, choose a middle size, not so great, nor yet of the smallest ranck, but a middle sort.

Another reason to prove that Wheat, when it is at the best, decays soonest, you shall see in this following Experiment. Sow of this Wheat the next year, whether it be washed or not washed, yet it w ll be very smutty; whereas if you sow leaner, or a middle wheat on the same Land, and the same Season, yea, that very day, yet the one will turne smutty,

smutty, and the other will not, which proveth that the plump and fulleſt Wheat, being at its height and period, returns, decayeth, and cometh to nought.

There is a procedure mentioned among *Mr. Speeds* notes, for liming Corn that carries a good probability of advantage with it. Firſt, The Grain was ſteeped in ſtrong Brine of Salt, that would bear an Egge twenty four hours, and then being laid S. S. S. with Lime, (that is) there was laid a layer of Corn firſt, and then a layer of Lime, and then again a layer of Corn, *&c.* the Lime cleaved to the Wheat, and was ſowed on ground not worth two ſhillings an Acre; the effect was, That it bare as good a Crop of wheat as ever was ſeen in *England*, and afterward three Crops a year of Clover, exceeding good, one whereof was equal in value to a Crop of Wheat: This being matter of Fact, I believe it, as to improvement by fertility, becauſe the Brine works very conſiderably in ſmall proportion, and Lime in this conjuncture may do well, both to fertility, and defence of the Grain againſt Grubs, and Inſects, and Worms, that abide in the Earth; but ſurely as to blaſting, and Crows and Birds that ſpoil the Corn in the Ear, it has no influence.

Moles by watering are drowned, or driven up to ſo narrow a compaſs, that they may be eaſily taken; I have known them to have been forc'd to leave their holes to run upon the Turf,

Turf, to save their lives from the water-flood. Mr. *Blith* relates, that one Spring, about *March*, one Mole-catcher and his Boy, in about ten dayes time, in a ground of ninety Acres, being just laid down from Tillage, took about three Bushels old and young; they were not to be numbred, most of them being young and naked, and this he onely did, by casting up their Nests, which are alwayes built in a great heap, of double bigness to the rest, most easily discerned, and then the old ones would come to look their young, which he would snap up presently also: At another Season then *March*, which is their time of breeding, such success is not to be expected. In other times the best way is, if there be any Hedges near, to set the Gins or Traps there, for their ordinary roads are in such Hedges, and other places they cast up, are but of uncertain use; as when they intend forage for one time, though it may be that they mind the use of that passage no more at all. *Bellonius* advises to bury Moles in those places, whence you would drive the rest of that Vermine; and there may be somewhat in that remedy: For many living Bodies have a great dislike to, and antipathy against the putrified Bodies of their own kind: Thus worms, putrified at the Belly of a Child outwardly, and the powder given inwardly, are esteemed as Medicines destructive to the worm in the Belly, though the latter way is by some thought to breed more

more then it kills. Nay, in Vegetables 'tis agreed, That a young Orchard will not thrive among the Roots of an old rotten Orchard, the reason whereof, some suppose to be the antapathy of the young, against the old putrifying Roots; but of this effect, other reasons may be as probable.

There be some other remedies for the same annoyances, as particularly, for the destruction of Ferne, the Author named gives this prescription: In the Spring, when the Ferne begins to grow a little above the Grass, while it is young and tender, take a crooked Pole, or piece of wood about six foot long, coming in at one end like a Bow, or made like a blunt Sithe; with this strike off all the heads of the Fearn, as low as you can, even to the ground, if possible; do this the second or third time, and it proves generally a certain remedy. The reason, as I suppose, is the putrefaction of the Ferne, it being a very moist Muscilaginous Plant, by its own juice, and the moisture of the Earth, by which the very Roots themselves come to be corrupted, or else the deprivation of all the Buds that germinate from the Root, by cutting off the Sprouts so unseasonably.

For Ant-hills, to destroy the Insects, and take the hills down, this manner is prescribed; Divide the upper Turf into five or six parts, then take it down with a turfing Spade to the bottom of the Banck, the Turf being

cut

cut as thin as can be under the Roots of the grass; then take out the Core of the Banck, that when the Turf is returned to its place, it may lie there lower somewhat than the surface of the Earth, that the moisture, which will be a certain destruction of the Ants, may a little reside there: This must be done in *November*, *December*, or *January*, that the roots of the grass may the better take to the ground before hot weather comes in the Spring.

Among Mr. *Speeds* notes, there are these Receipts; take red Herrings, and cutting them in peices, burn the pieces on the Mole-hills; or you may put Garlick or Leeks in the Mouthes of their Hills, and the Moles will leave the ground. I have not tryed these ways, and therefore refer the Reader to his own tryal, belief, or doubt.

I had almost forgot to mention the change of Seed from grounds of a contrary nature, which by the experience of Husbandmen is found very advantagious, and is thought to prevent smootiness. 'Tis the custome in *Buckinghamshire*, for those of the Vale, to buy their Seed from the Chiltern, on this account; and this experiment is found profitable in Wheat, Barly, Pease, and all Field Grains; and not so only, but also in Garden Plants.

For the preserving early or late sowed Corn, or the same when it begins to corn in the Ear, from Crows, Rooks, or Jack-Daws, Mr. *Blith* has invented this Scare-Crow: You must,

muſt, ſayes he, kill a Crow or two, and take them into the field where they haunt, and in the moſt obvious, plain, perſpicuous places, make a great hole of two foot over, and about twenty Inches deep, on the higheſt ground in the Field, which hole muſt be ſtuck round about the edges with the longeſt Feathers; the bottom muſt be covered with the ſhorteſt, and ſome part of the Carkaſs; and that Turf or Earth that is digged out of the hole, being laid round upon a heap, you may ſtick round with Feathers alſo. One Crows Feathers will dreſs two or three holes, and about ſix or eight holes will ſerve for a Field of ten or twelve Acres. The Feathers will remain freſh a Month, unleſs ſtore of Rain or weather beat them much; and then (if needful) they muſt be renewed.

CHAP.

CHAP. VIII.

Of the Means of Improvement and beſt culture of ſuch Plants or Flowers as are uſually cultivated in Gardens or Orchards, and of the ways uſed for the removing of ſuch annoyances as are commonly incident to them.

Num. 1. *Of the annoyances in general, incident to Garden Plants.*

THe Politician ſpeaks it to be a part of as great skill and proweſs to defend a place already gotten, and to improve it to the benefit of the Prince and Inhabitants, as it was at the firſt to arrive at the Conqueſt; this is alike true in the Gardiners Province: It is no eaſie thing with him to raiſe a ſtock of choice Plants, by the ſeveral ways of propagation above mentioned, and as hard to preſerve them, being propagated, from deſtruction by forreign and inteſtine violence. For either the ſharpneſs of cold, the torrid-

neſs of the Sun, Vermine, or other accident from without, or want of convenient and nouriſhable ſoyl of earth and water, and other Elements proportionable to the Plant, will be ſuch internal deficiencies, as to cauſe utter deſtruction: or the haſtineſs and premature, or on the contrary, the tardy and ſlow germination thereof will hinder its excellency; or weeds, or other vegetables, may grow up to its hinderance: and many other impediments there are, which with their ſeveral remedies, as they ſhall ſuggeſt themſelves to my thoughts, I ſhall propoſe in the preſent chapter, the laſt of this diſcourſe.

N. 2. *Of defences for choice Plants from cold.*

One great annoyance to all choice flowers and tender Plants, ariſes from the violence of the Winter cold, the defence againſt which you ſhall have as far as I am able to give you, and can think of in the following directions.

Firſt in the Kitchin-garden, Aſparagus and Artichokes require ſome defence; Aſparagus is uſually covered with Horſe-dung which they rake from it in the Spring. Artichokes are uſually ſet in Rowes two foot and half a ſunder, and are preſerved in the Winter by trenching them, and filling the trenches with dung that will not freeze, but keep the ground from freezing all above it.

Then

Then secondly, in your Flower-garden let those Bulbous Roots that are tender, such as the great double white Daffodil of *Constantinople*, and other fine Daffodils that come from hot Countries, the *Ornithagolum Arabicum*, purple Montain, Moly, &c. be planted in a large Tub or pot of earth, and housed all the Winter, that so they may be defended from the frosts, or else, (which is the easier way) keep the Roots out of the ground every year from *September* after the leaves and stalkes are past until *February*, in some dry, but not hot or windy place, and then Plant them in the ground under a South-wall, which are Mr. *Parkinsons* directions.

Also the late Pine-aple Moly; the Civet Moly of *Mompelier*, the little hollow white *Asphodil*, which though its roots are not glandulous as to be capable of the last way, yet they are well preserved many years if by housing they shall be defended from the winter wet and cold.

Rose-bay Mirtles, the *Indian Gelsimines*, *Jucca Indica*, Orange-trees, must be housed in the Winter, so likewise while they are young, the Cypress, Bay, Piracantha, Mirtle, Pine-tree, Rose-bay with Spanish-seed, or at the least they must be covered with Straw, or Ferne, or Bean-hame, or such like thing laid upon cross-sticks to bear it up from the Plants till they are two or three years growth, and fit to be removed to their places. *Arbutus*, or

the Strawberry-tree, Sea-Ragwort, the Pomegranate, and the Indian Figge require the same care.

The way of preserving Myrtles, Oranges, and other tender Plants, as it is practised by that most ingenious Florist and Gardiner *Mr. Rose*, is thus directed by Mr. *Rea*. All these Plants, saith he, are commonly set in cases, and with Oranges, and tender Plants, housed in the Winter, and increased by Layers. The best time to Transplant the more hardy kind of Greens, is about the tenth of *March*, and for the more tender to be set in cases toward the end of *April*; the Earth you set them in must be fresh, and such that hath long lain on an heap well mixed with good old neats dung well rotted and screened, set not your roots too deap by any means, rather chusing to leave some part of the roots uncovered, then to place them too much under ground: as soon as they are set, water them, and keep them sheltred from Wind and Sun, until they have taken root, after a fortnight, you may by degrees acquaint them with the Air, and when you find that they have gotten strength, then set them abroad. The same order is to be used with such Layers as you shall take off to Plant in cases in *August*.

Commit your cases with Oranges, Myrtles, and other tender Plants betimes into the Conservatory, but shut them not up in the day time, especially unless constrain'd by Fogs

or

or Frosts, which lasting long, you must on fair dayes acquaint them with the Sun and Air again by degrees: During extream Frosts, and when water will freeze in your Conservatory, in default of stoves or raised hearth, you must attemper the Air with pans of Charcoal, especially at night let the Coals be half burnt out before the pans be placed, and then not set too near the Plants. In *March*, when the great Frosts are pass't, open the doors and give them Sun and Air by degrees, a little at first which increase with the Spring; about the end of *April* set them forth, and wash them clean (especially the greens) with a watering pot, from Dust and Cobwebs. And you must not forget whilst they are in the house to water them gently, especially in *November*, and after long frosts, but let not the water touch the leaves of any of the greens, and chuse rather to give housed Plants too little, then too much water. Assoon as the heats begin, cover the Earth in the Cases some considerable thickness with Moss. It will keep the Earth moist and friable, and water them as you find cause every Spring and Autumn, that is, a little before you set forth your Plants, and before you house them, you must take some of the earth out of the cases, and open the rest with a fork or other tool, not hurting the roots of the Plant, and fill them up again with ranck Earth, two parts Dung well rotted, and preserved for that and such like purposes.

Ferrarius commends a Garden-houſe with Walls of thick Moſs as good, and ſo without queſtion it is, againſt the Winter cold and Summer heat.

Some defend their Mirtles, Pomegranates, and ſuch other tender Plants, either by houſes made of ſtraw-like Bee-hives, or of boards (with inlets for the Sun by caſements, or without them) Litter of Horſe-ſtables being laid in very cold weather about the houſes of defence.

It was a cuſtome in *Italy*, to make ſuch fences for Myrtles (eſpecially when young) as appears by *Virgils* Verſe,

Dum teneras defendo a frigore Myrtos.

The Roots of the Marvail of the World, Mr. *Park* has preſerved by art a Winter, two or three, (for they'l periſh being let out in a Garden, unleſs it be under a houſe ſide, or ſuch dry place) becauſe many times the year not falling out kindly, the Plants give no ripe ſeed, and ſo Gardiners would be to ſeek for ſeed to ſow, and Roots to ſet, if this or the like Art to keep them were not uſed: 'Tis thus, within a while after the Froſts have taken the Plants that the leaves wither and fall, dig up the Roots whole, and lay them in a dry place for three or four dayes, that the ſuperfluous moiſture on the outſide may be withered and dryed; which done, wrap them up ſeverally in two or three brown papers, and lay them by in a box, cheſt, or tub, in

ſome

ſome convenient place of the houſe all the winter time, where no wind or moiſt Air may come unto them, and thus ſhall you have theſe Roots to ſpring afreſh the next year, if you Plant them in the beginning of *March*, as Mr. *P.* has by his own relation ſufficiently tryed. But ſome have tryed to put them up in a Barrel or Firkin of ſand and aſhes, which alſo is good if the ſand and aſhes be throughly dry, but if it be any thing moiſt, or if they give again in the Winter, as it is uſual, they have found the moiſture of the Roots, or of the Sand, or both, to putrifie the Roots.

The ſame Author takes notice that it is one great hurt to Gilly-flowers in the Winter, and to all other herbs, to ſuffer the Snow to lye upon them any time after it is fallen; for it doth ſo chill them, that the Sun doth (though in Winter) ſcorch them up, ſhake therefore off your Snow gently, not ſuffering it to lye on a day if you can; There is the like inconvenience from Froſts which corrupt the Roots, and cauſe them to rot and break, For prevention, take Straw, or Litter of an Horſe-ſtable, and lay ſome thereof about every Root of your Gilly-flowers, eſpecially the beſt ſorts, cloſe unto them upon the ground, being careful that none lye upon the green leaves, or as little as may be: Let it lie till *March* (with its winds) is paſt. The general remedy for theſe, and all flowers, is to be covered with Mats, which are remove-

able at pleasure. The choicest of all are put in pots and housed.

Now though those who are very careful, commend the forementioned ways, yet there are others blame these practises in the case of *July*-flowers, as being noxious to them, and hindrances to their flourishing and fairness, advising rather that they be neither potted nor cover'd with Mats, which use draws Mice and VVorms to them, which do them more harm then the winter it self, being contented for their improvement to place them in good mould, and not to suffer too many slips on a Root, and observing this in the pruning, that you do not slip them, nor cut them off in a joynt, the first of which wayes causes a great wound in the Mother plant, and the second is very prejucial on other Accounts.

Num. 3. *Of shades requisite to sundry Plants, especially when young, for their defence from the Sun and Wind; with an Advertisement from Mr.* Rea *for the improvement of the double yellow rose.*

All sorts of Carnations, Gilly-flowers, and Plants that are tender and young, especially your *April* and *May* Seedlings, are to be preserved and defended from the violent heat of the Sun and blasting winds: I have seen whole Beds of divers sorts of young Seedlings, utterly burnt up at their first appearing, by the violence of two or three hot days. Nor do

Seed-

Seedlings only require this, but all Plants that are not altogether wild, of how woody substance soever, that are newly growing, from cuttings, or parts without actual Roots.

Shades are commodious, if not absolutely necessary to many Plants, even when they are well rooted, as Bays, Lawrel, Savin, and most wood-plants, a mixture of Shade and Sun to Straw-berries; so that the Lord *Bacon* wittily advises, to sprinkle a little Porrage-seed on the Strawberry-bed, for that the Straw-berries, under those Leaves, grow far more large then their fellows.

The best shades are made by thin well pruned Hedges drawn through the Garden or Nursery, or by Mats laid over them, and underpropt by a frame of light Poles: But all Seedlings, Flowers, or other Plants that are kept in Pots, are readily removed into convenient shade at pleasure.

Among the requisites for the Improvement of the double yellow Rose, this of shade is one, but because the improvement of this Plant hath been a particular care of the most ingenious Mr. *Rea*, I shall set it down in his own words. 'VVhereas, saith he, all other Roses 'are best natural, the double yellow is best 'inoculated upon another Stock; others 'thrive and bear best in the Sun, this in the 'shade; therefore the best way that I know 'to cause this Rose to bring fair and kindly 'flowers, is performed after this manner;

'First

'Firſt in the ſtock of a *Francfort* Roſe, near 'the ground, put in a bud of the ſingle yellow 'Roſe which will ſhoot to a good length, then 'half a yard higher then the place where the 'ſame was budded, put into it a bud of the 'double yellow Roſe, which growing, the 'Suckers muſt be kept from the Root; and 'all the buds rubbed off except thoſe of the 'kind deſired, which being grown big enough 'to bear, (which will be in two years) it muſt 'in Winter be pruned very near, cutting off 'all the ſmall ſhoots, and only leaving the big-'geſt; cutting off the toos of them alſo as 'far as they are ſmall; then in the Spring, 'when the buds for leaves come forth, rub off 'the ſmalleſt of them, leaving only ſome few 'of the biggeſt, which by reaſon of the 'ſtrength of the ſtock, affording more nou-'riſhment then any other; and the agreeable 'nature of the ſingle yellow Roſe, from 'whence it is immediately nouriſhed, the 'ſhoots will be ſtrong and able to bear out 'the Flowers, if they be not too many, which 'may be prevented by nipping of the ſmalleſt 'buds for Flowers, leaving only ſuch a num-'ber of the faireſt as the Tree may be able to 'bring to perfection, which Tree would 'ſtand ſomething ſhadowed, and not too 'much in the heat of the Sun, and in a Stan-'dard by it ſelf rather then under a Wall. 'Theſe Rules being obſerved, we may expect 'to enjoy the full delight of theſe beautiful

'Roſes,

'Roſes, as I my ſelf have often done by my 'own practiſe in divers Trees ſo handled, 'which have yearly born ſtore of fair flowers, 'when thoſe that were natural, notwithſtan- 'ding all the helps I could uſe, have not 'brought forth one that was kindly, but all 'of them either broken, or as it was blaſted.

Num. 4. *Of Watering.*

Another Remedy neceſſary for the preſervation of divers Plants, and improvement of others, is watering. We have already ſpoken of the improvement of Meadows and Cornfields by floatings, it remains onely that we conſider how it is aſſiſtant to choicer Plants.

Water is neceſſary to all ſtringy Roots at their firſt removal, and at any other time when any Trees or Plants are weak by reaſon of drougth. All manner of Layers muſt be eſpecially regarded and aided by this aſſiſtance, and ſo muſt thoſe Plants that are to be propagated by the circumpoſition of a Basket of Mould. The Plants of Tobacco are alſo much improved by frequent waterings, Melons, Gourds, Cucumbers, though well rooted, require this help.

For all theſe Intents, water that hath ſtood in the Sun two or three dayes at leaſt is beſt; but different Plants require for their Improvement a different ſort of watering; For thoſe Vegetables that are content with a hungry ground,

ground, will thrive well enough with a thin water Sun'd. But your Kitching Plants are best improv'd by fat water, such as is usually gathered into Ponds after a Land-flood, or from the washing Dunghills.

Yet herein also some Caution is to be used, first that your water be not so foul as to breed flies or other Vermine, but so clear as to be proper to make drink of. *Magnenus Excircit.* 1. *De Tobacco & Manna*, hath this observation, *Anno* 1645. *Æstate ficciori* (saith he) *feniculum et alias plantas irrigari jusseram. Aqua sumpta est ex puteo fœtenti. Ne ramus quidem fuit in feniculo, ne granulum Unum quod Vermiculis non scateret. Idem absynthio contigit; & nisi advertissem Tobacco adnatæ erant exiguæ Muscæ capite nigro, ventre virescente, quæ plantæ morbum induxerant, sed mutatâ irrigatione rediit sua puritas herbæ.* In the year 1645. the Summer being very dry, I ordered Fennel and other Plants to be watered; the water was drawn out of a stincking well; there was no branch nor leaf in the Fennel that was not covered with worms. The same happened to wormword, and unless I had taken notice to prevent it, there were little flies with black heads, and green bellies that covered the Tobacco, and had diseased it. But changing the water, the Plant recovered its former purity.

Other Cautions are also to be used, as that you offend not in quantity: For by too much water one may chill & over-glut the ground.

Those

Thoſe are induſtrious Gardens, that water often, and but a little at a time. In the Spring and Autumne when Froſts are feared, it is better watering at Morning then at Night, but in Summer, the night is eſteemed the better ſeaſon.

There is a pretty way of watering choice Plants, by wetting a ſtreiner, and then letting one end of it hang over a Veſſel of water, which will gently draw up the water from the Baſon, and let it fall down gently by the ſtreiner to the root of the Plant.

Num. 5. *Of Annoyance by Plants growing too thick, and near together: And of the Remedy thereof, and Improvement by pruning Trees, and ſetting them at great diſtances. Of the Improvement of Garden-flowers, by plucking off ſome of the young Germen, when they are too numerous. Of the ſizing of Turneps, Carrots, Parſneps, and of Weeding.*

There is no greater hindrance to the growth and thriving of many ſorts of choice Vegetables, then their being ſo crowded together, that their Roots, Branches and leaves, enterfer with, or at leaſt ſtand to cloſe one to another, and therefore in all Orchard and Garden plants, whoſe fruit and flower you deſire ſhould be fair, and whoſe growth you would have conſiderable, you muſt provide that they may be ſet at convenient and proportionable diſtances.

distances. Apple-trees, Pear-trees, Plum-trees, Cherries, and other Plants, are of divers heights, both when compared in the same, and when in different species or kinds, some Apple-trees grow to a much greater tallness then some others, Pears to a greater height then Apples, so that it is hard to appoint a certain distance for Trees in an Orchard, twenty foot is space little enough for Standards of common Apples or Pears; but a certain Rule is, to provide that one Tree shade not another, and therefore let the lowest Trees, if you intend to make the most of your ground, be set South, and the highest Pear-trees stand to the North; for should the higher Trees stand South, they would cast their shade over the rest of the Orchard.

This Doctrine of setting Trees at such distances, the Husbandman hates, for two reasons; one is, Because it takes too much of his Pasture from his Cattle; and the other is, That by this means he can have but little Fruit in his Orchard for many years: Therefore to gratifie his covetousness, I shall propose him this practicable way of following, and prosecuting my intention to the utmost profit, without putting him to the mentioned grievances. For first, I shall order that he Plant his Orchard full of Trees, within three yards distance one of another, or somewhat nearer, if he please; these shall bear him after a year or two, as many apples as a well grown

grown Orchard usually carries: then let him let this ground to a Gardiner, that it may be digged and dunged seasonably, to bring Kitchin Plants, for from this Culture the Trees will receive great advantage. When the Trees are big enough, with the defence of a strong stake, and some Bushes, to be secured from Cattle, let him transplant them into Pastures of the best Soyle, where they may stand at great distances to be shelter to Cattle, and no prejudice to the Grass: One Tree at such distance, shall bear as much as ten in some Orchards, and thus continue removing, as your Trees grow big enough. I count five or six inches about to be a good Size, the bigger they are, the more care must be taken in their removal, that the Root be transplanted entire as may be, without much dis-branching it, or cutting away the spurs. And it is convenient, that in the heat of the first Summer, wet Straw be laid upon the ground about the Root.

If you have no pasture to transplant into, sell your Trees to those that have, or set your Standards of strong Trees at twenty foot distance, and fill up the rest of the ground with Kentish Codlings; Nurse Gardens, Burts, which are cheap Plants, being propagated by Suckers, or with dwarf Trees made by Circumposition, which may be cut down when the other Orchard thickens too much, and in the mean time are very plentiful bearers.

Pruning

Of Pruning. Pruning Trees is used likewise chiefly to this intent, that the Rays of the Sun may have passage to all parts of the Tree, so that 'tis a good way for the Pruner to look upward from the North-side of the Tree, upon the South and East, and to cut off, or rather make thin, such boughs which he finds so thick as to obstruct the Sun: All Boughs likewise that gall others, and that are actually dead; providing always, that the Boughs taken off be as little as may be, though the more in number, that so the sap may make up the Bark, and the Tree be not decayed by lopping off the greater Stems: Which is very perversly done by most Gardiners, who think that to Prune a Tree, is to cut off the lower Boughs bigger or less, because they see small watery Fruit grow on them; whereas if the Sun was let in upon them, their Fruit would be rather more, then less forward, than that which grows in the middle of the Tree: I count it general, that the under Boughs ought never to be cut off, but when you have respect to grass Roots, or other Garden-stuff, which grows under the Trees, or for the security of the Trees from the browsing of Cattle, so that to bare the Trunk of the Tree, for four, five, or six yards, as some do, and nourish it to no profit, but to bear and carry up the head to another Region, that Rooks may the better build therein, is a common folly, and ridiculous, if well considered. And

And for lopping off great Boughs, I may here add an obſervation touching Elms, which is, That if the top of an Elm of any bigneſs be cut off, the rot will immediately begin there, and by wet, and other accidents, run downward, and cauſe that hollowneſs which is ordinarily ſeen in Trees of this kind.

Another Rule of Pruning is, That the Gardiner never cut off thoſe Boughs which are ſet and adopted for bearing, which is eaſily known for Roſes particularly, and Raſps and Vines alwayes bear upon a freſh ſprout, ſhot forth the ſame Spring, ſo that the more you prune a Roſe, Raſp, or Vine, the more freſh ſprouts of that Springs growth are emitted, and the more ſuch ſprouts, the greater number of Roſes, Raſps and Grapes ſucceed, unleſs ſome particular accident deſtroys them. Many Fruits bear from the ſhoots of the antecedent Spring, as the generallity of Apples, Pears, Peaches, Nectarins, Aprecots: Many ſeem to grow from Wood of longer growth, but in that a man may be eaſily miſtaken, becauſe a very little, and a Spring of ſcarce diſcernable growth, may be enough to ſerve as a foundation to the pedal of the Bloſſom or Fruit, which ſtanding on the old Wood, it may be thought that the pedal or ſtalk of the Fruit, ſtands immediately on the Wood, and that there was no Spring interceding. Sometimes the Bloſſoms of the ſame Tree, ſtand both on the Wood of the preſent and antece-

dent Spring, as it is frequently seen in Kentish Codlings, Nurse Gardens, great bearing Cherries. But where ever the Blossoms are, and there are many Buds fitted and prepared for bearing, they are discerned by the skilful Gardiner, and may be seen by any person, for those are more full in their shutting up than other Buds are, and stand not so close made to the stem of the Branch whereon they grow, and contain more small leaves in their Body then other Buds, being, as I apprehend, the actual rudiment of the ensuing Blossom: Such Boughs therefore, whereon plenty of these full made Buds, or inchoate Blossoms are seen, the Gardiner spares, if he is wise, for the present year, and (where he may) prunes off such whereon he sees no such propension to fruitfulness.

The best time to Plash, Prune, and nail Wall-trees, is in *February* after the great Frosts are past, except Peaches and Nectarins, which being cut before the rising of the Sap, are apt to die after the knife, and so to stump, and deform the Tree, and therefore such must be left until they begin to put forth buds and blossoms. Spread the branches upon the Wall like the ribs of a screen Fan, or the fingers of your hand displayed, and let not one cross another leaving no place bare; such as will not come handsomely to the Wall, must be cut off close to the stock, and the end of the small branches, (These are *Mr. Rea*'s directions)

rections) close behind a leaf Bud, and in the Summer when they put forth new wood, rub off such buds as growing may deform the Tree. After Midsummer you must give your Trees a second pruning, by cutting away the new lances to give Sun and Air to the fruits, to cause them to ripen, and to be well coloured, the well and seasonable pruning of Trees in Summer, will cause them to be set thick with fruit buds, and to bear plentifully.

The fairness and largeness of Flowers and Fruits, are very much augmented, by preventing the running up a multitude of Stalks from the same Root: The Gardiner observes this precisely in his Carnations and Gilly-flowers, not suffering above one, two, or three Spindles upon such Roots or Stools where he intends a greater fulness and largeness in the Flowers; and in Anemones the observation is, That if any of the Latifolia's bring a single Flower on the same Root with the double; then the cause usually is, the standing of too many Eyes or Germens, and their depending from the same Root; and the remedy in like manner, nothing else but the taking off those Off-sets or Suckers; and parting them from the principal Root, which otherwise is robbed of that matter which might raise in each Flower, both fairness and multiplicity of leaves.

Shrubs likewise that bear either Fruits or

Flowers, and are to be governed in like manner; Goosberries and Currants degenerate to ſmallneſs, or bear not at all, without this care and proviſion, that the Suckers be taken away: This obſervance is likewiſe abſolutely neceſſary to Damask Roſes, for when they grow up to thick Buſhes they ſcarce bear, whereas being kept to grow in one ſingle great ſtem, being orderly cut, and not growing in the ſhade, they bear exceedingly.

For Vines, it is a Proverb, make your Vine poor, and it will make you rich: The fewer principal Stems are left, the more it bears, and the reaſon is, becauſe the Grapes are born upon ſhoots of the ſame Spring; and thoſe ſhoots then moſt plentifully ariſe, when the head of the Vine, in proportion to the Roots, is leaſt, as 'tis ſeen in all Trees, which ſhoot out more immediately after their heads are lopt, than any other year. Pompions follow the nature of Vines, and as two or three ſtems is enough for the Vine, ſo two or three runners, and no more, ought to be permitted by him that intends the greateſt fairneſs of this fruit.

It may be proper enough here to ſpeak of Weeding and Sizing: The latter operation is, the plucking up Roots or Plants that are of uſe in themſelves, but offenſive to others in the ſame Beds, by reaſon of their nearneſs: Thus Turneps are howed up when they ſtand within a foot diſtance each of other; for it is

beſt

beſt, when at their full growth their leaves touch not one another: Carrots are plucked up, when they are an inch Diameter at the head, for then they are of uſe, or ſooner, if the thickneſs of their ſtanding require it; and this is general for all Roots, Parſneps, Radiſh, Skirrets, that grow by Seed: Some ſow (as I mentioned above) Parſneps, Carrots, Radiſh, and Sallad Herbs in the ſame Bed, firſt Sizing out the Sallad Herbs and Radiſh, then the Carrots as they grow, leaving the Parſnips till Winter, by which means their ground is always full, yet by reaſon of the Sizing in due times, never over-burthened.

The culture of Straw-berries requires ſomewhat like Sizing, (*viz.*) The cutting off immediately after bearing the ſpires and ſtrings, which would multiply unto too many Roots and Branches, to have plenty of fair Straw-berries: Nor is this once only to be done, but as often as they ſpring anew, ſo often are they to be taken off, until the time of the Bloſſoms draws on, I have ſeen ſome that were not over curious, tear off the ſtrings by harrowing up and down their Beds of Straw-berries with an Iron Rake.

Some make a queſtion, Whether Plants of the ſame kind, by reaſon of a ſuppoſal that they require the ſame parts for nouriſhment; or Weeds and Graſſes, by their too great vicinity, may create more annoyance to their Neighbours? I decide not the queſtion, nor

can reconcile the Gardiner to Weeds, whileſt he finds his ſtrongeſt Plants deſtroyed by them: I have ſeen many Trees in a well grown Nurſery, ſpoyled by the Graſs that grew amidſt them; and as I remember, the very Bark of the Trees themſelves was rotted, by a dew caſt upon them from the Graſs: I have likewiſe obſerved, a ſtrongly grown Quickſet of white Thorn, to have been deſtroyed by Alexanders, which it is at the Readers choice to account as a Weed or cultivated Plant.

The time of pruning generally is the dead of Winter, for ſuch Plants as conſiſt of a woody ſubſtance: Pompions are deprived of their ſuperfluous creepers, and other Gourds likewiſe, at their firſt time of ſpringing and divarication of their Branches. The ſeaſon of pruning for acceleration of ripeneſs, is when the fruit is made, and begins to grow to ſome bigneſs, as generally they are, about Mid-ſummer: Some have a third time of pruning Wall-fruit, *viz.* at the time when the Fruit is taken off, as they do Roſes likewiſe, when the Flowers are newly gone.

To cut the Branches or Sprigs of a Flower or Tree quite off, cannot properly be called pruning, yet ſometimes it proves an uſeful operation for ſuch Plants as are ſtunted, as they call it, in their growth, or for Trees that are crooked, or have been bitten with Cattle, or are grown old: Thus Wood-men count it beſt to cut thoſe Stools of under-Wood down

down to the Root, that it may begin to shoot afresh, that have been much browsed by Cattle; and cut down their hedges to the Roots when they grow old and Mossy.

Gardiners likewise, if by reason of a sharp Winter their Anemone's are pinched with cold, and starved, let them not immediately run to flower, but cut off the first Springs to the ground, that in a better Season they may lay a stronger Foundation for the bearing of fuller and fairer Flowers.

Num. 6. *Of Pismires, Earwigs, Canker and rottenness in choice Plants, Catterpillars, Mossiness, Bark-binding, Bursting of Gilly-flowers.*

There are many other annoyances to Vegetables, and generally sooner reckoned than remedied, a word or two I shall speak, of as many of them as come into my mind: Pismires, especially those of the black kind, are exceeding troublesome in some Gardens, for they climb the highest Trees, and spoyle the Fruit, are commonly esteemed remedilesse. *Belonius*, who took exceeding pains for improvement of Vegetables, commends the decoction or Broath made of any sort of Spurg, as very efficacious for this purpose: Some draw them to one place, by burying Carryon where they most resort, and then scall'd them with seething liquor.

To divers choice Flowers, but Carnations and Gilly-flowers eſpecially, Ear-wigs are a great annoyance: Mr. *P*'s way of ſetting Beaſts Hoofs among the flowers, upon ſticks, to take them, is uſed of every Body here, and generally lik'd: Some that ſet their Flowers in Pots, ſet the Pots in Earthen Plates, with double Verges, containing water, or water mingled with ſoot in the outward verge, to drown the Vermine that ſhall attempt the pots, and rain water in the ſecond, which may paſs through the holes of the pots to water the earth therein contained.

The rottenneſſe and hollowneſſe, that through age and too much moiſture, bulbous and tuberous roots, and the beſt Anemones eſpecially, are ſubject too, is thus provided for; the diſeaſe muſt be laid open, and the rottenneſs cut out ſo, that in the root there be no capacity left to hold water, which I have often mentioned to be a great Enemy both to them and Tulips. *Ferrarius*, and ſome others, preſcribe Plaiſters of Roſin, Turpentine, and Wax, to apply to the Cicatrices of the wounded Root, which notwithſtanding, I have no regard for. The ſame Author ſayes, that in moiſt Winters Anemones do beſt in pots, in dry, better in beds: With us they are ſeldom potted, but the borders for theſe Plants are uſually laid on pretty high ridges, as Husbandmen lay their Corn Land in deep and moiſt ground, to prevent the miſchiefs

that

that uſually happens by too much wet.

Mr. *Parkinſon* ſayes, That if you perceive that your Gilly-flower leaves change any of their Natural freſh colour, and turn yellowiſh, or begin to wither in any part, it is a ſure ſign that the Root is infected with ſome canker or rottenneſs, which will ſoon ſhew it ſelf in all the reſt of its branches, and therefore betime, (elſe 'tis in vain) adviſes that you cover all, or moſt of the branches, with freſh Earth, or elſe take the faireſt ſlips from it, or according to Art lay it: This way of Mr. P. may be applyed unto other Vegetables. Or elſe you may try Mr. *Blakes* Remedy for this Diſeaſe in Gilly-flowers and other choice Plants, which is this, Take tarr, and the yelk of an egge, and mans ordure, and apply it to the canker-eaten, and it will cure it.

I know no better way to deſtroy Caterpillars, Palmer-worms, and other Vermine of that kind, then by cruſhing their Eggs; as ſoon as they are laid upon the leaf by the Fly, ſome bruſh them off with wet cloaths: 'Tis obſerved, that the little Fly that uſually blows upon the Cabbage, chooſes ſuch Plants as are youngeſt, and eſpecially thoſe that were raiſed in hot beds, or endured leaſt of cold in the Winter preceding.

Moſſineſs of Trees, comes generally either from the barrenneſſe or coldneſſe of the ground, and therefore I count it vain to attempt the removal of it, without taking away the

the cauſe, and making the ground better; which being done, it will be proper enough to rub down the Trees in a wet day with an hair cloath.

Trees likewiſe are ſometimes Bark-bound, eſpecially ſuch, the Grain of whoſe Bark runs round the body of the Tree, as in Cherry-trees, and not ſtraight upward, according to the grain of the Tree, as in Apples, Pears, *&c.*

For the Bark is not generally, as I ſuppoſe, nouriſhed by appoſition of a new rinde to it, as the ſubſtance of the Tree is, but by interpoſition of particles, amidſt the particles of the rind already made, which if it be ſo hard as not to admit other Particles for its enlargement, there can be no new addition of a new coat of wood, which ought to accrue every year to the Tree, for there will be no ſpace wherein the ſap may aſcend, which is to be hardned into ſuch new wood, unleſs by renting the whole coat of Bark, which ſometimes happens.

The remedy for this diſeaſe, both in Cherry-trees, and other Trees, thoſe chiefly whoſe Barks are hardned and grown cruſty by long ſtanding in ſhadowy places or barren ground, is, that the year after their removal, or upon addition of better ſoil in ſtreight grained Barks; and without either removal or addition of ſoil in Cherry-trees, and other croſs-grained Barks, or in any Trees whoſe Barks rend of their own accord, the Barks be ſlit

from

from the top of the Tree to the bottom of the Stock, and that according to the bigneſs of the Tree, in one, two, or three places: This is a Chyrurgical remedy that never fails, and is eaſily performed.

Carnations and Gilly-flowers, happen to be often deformed, eſpecially thoſe which are of the largeſt ſorts, by burſting the Calyx, Cellar, or Caſe wherein they are ſet, and the uſual remedy is, to inlarge the five inciſions proportionably, by cutting them deeper with a knife; or to ſteep ordinary Beans in Water, and then ſlipping off the outward coat of the Bean, to put it (the end being taken off) upon the head of the Carnation, which will keep the five lips together, and preſerve the Flowers from breaking; nor will theſe Hoops, made of the coats of Beans, ſhrink with the heat of the Sun, as thoſe made of the rind of Willow, ſlipped off for the ſame purpoſe, uſually do: One Bean is long enough to make two hoops, for they need not be above a quarter of an inch in breadth.

Num. 7. *Of improvement and meliorating of divers Sallad Herbs, by blanching or whiting, from the French Gardiner, and Mr.* Parkinſons *Obſervations.*

The Lettuce-Royal, being upon removal, ſet at a foot or more diſtance, when you perceive that the Plants have covered all the ground,

ground, then in some fair day, and when the morning due is vanish'd, you shall tie them in two or three places one above another, which you may do with any long Straw, or raw Hemp, and this at several times, (*viz.*) Not promiscuously, as they stand, but choosing the faireſt Plants first, to give room and air to the more feeble, and by this means they will last the longer: The first being blanched, and ready before the other are fit to bind.

If you would blanch them with more expedition, you may cover every Plant with a small earthen pot, fashioned like a Goldsmiths Crucible, and then lay some hot soyl upon them, and they will quickly become white.

Concerning Succories, Thus,

There are several kinds of Garden Succories, different in leaf and bigness, but resembling in taste, and which are to be ordered alike.

Sow it in the Spring upon the Borders, and and when it has *six leaves*, replant it in rich ground, about eighteen inches distance, paring them at the tops: when they are grown so large, as to cover the ground, tye them up as I instructed you before, where I treated of the Roman Lettuce; not to bind them up by handfulls, as they grow promiscuously, but the strongest and forwardest first, letting the other fortifie.

There is yet another fashion of blanching it: In the great heats, when instead of head-

ing,

ing, you perceive it would run to Seed, hollow the Earth at the one end of the Plant, and couch it down without violating any of the leaves, and thus it will become white in a little time, and be hindred from running to Seed.

Thoſe who are very curious, bind the leaves gently, before they interre them, to keep out the Grit from entring between them, which is very troubleſome to waſh out, when you would dreſs it.

Remember to couch them all at one ſide, one upon another, as they grew being planted, beginning with that which is neareſt the end of the Bed, and continuing to lay them, the ſecond upon the firſt, and the third upon the ſecond, till you have finiſhed all the Ranges.

I find likewiſe two other manners of Blanching them for the Winter; the firſt is, at the firſt Froſts, that you tye them after the ordinary way, and then at the end of eight or ten days, plucking them up, couch them in the Bed where you raiſed them from Seeds, making a ſmall Trench croſs the Bed, the height of your Plant, which will be about eight Inches, beginning at one end. In this you ſhall range your Plants ſide by ſide, ſo as they may gently touch, and a little ſhelving; this done, cover them with ſmall rotten dung of the ſame bed: Then make another furrow for a ſecond range, in which order, lay your

Plants

Plants as before, continuing this order till you have finish'd: And last of all, cover the whole Bed four fingers thick, with hot soyl fresh drawn out of the Stable, and in a short time they will be blanched. If you will afterwards cover the bed with some Mats placed aslant, like the ridge of a House to preserve them from the Rain, they will last a very long time without rotting: When you would have any of them for use, begin at the last which you buried, and taking them as they come, draw them out of the range, and break off what you shall find rotten upon the place, or that which has contracted any blackness from the dung, before you put it into your Basket for the Kitchen.

A second manner of preserving it, is, to interre it, as before, in furrows of Sand in the Cellar, placing the Root upmost, least the Sand run in between the leaves, and you find it in the dish when they serve it. You need not here bestow any dung upon them, it is sufficient that the Sand cover the Plant four fingers high; and when you take it out for use, before you dress it, shake it well, the Root upmost, that all the Sand may fall out from the Leaves. Take them likewise as they happen to lie in the Ranges.

His directions for blanching Endive, are, that you cover it only with reasonable warm dung, and drawing it out at the first appearance of Frost, that you keep it under Sand in your

your Cellar, as you do other Roots, but first it must be almost white of it self.

The whiting of Endive, Mr. *Parkinson* commends, when done in another manner: After, says he, that they are grown to some reasonable greatness, but in any case before they shoot out a stalk in the midst for Seed, take them up, and the Roots being cut away, lay them to wither for three or four hours, and then bury them in the Sand, so as none of them may lie one upon another, or if you can, touch one another, which by this means will change whitish, and thereby become very tender, and is a Sallot for Autumn and Winter. Fennel is whited by some in the same manner, for the same use.

To procure the Chard of the Artichocks (which is that which growth from the roots of old Plants) you shall make use of the old Stems which you do not account of. For it will be fit to renew your whole Plantation of the Artichocks every five years, because the Plant impoverishes the Earth, and produces but small fruit.

The first Fruits gathered, you shall pare the Plant within half a foot of the ground, and cut off the stem as low as you can possible; and thus you will have lusty slips, which grown about a yard high, you shall bind up with a wreath of long Straw, but not too close, and then environ them with dung to blanch them.

Thus

Thus you may leave them till the great Frosts, before you gather them, and then reserve them for your use in some Cellar, or other place less cold.

Num. 8. *Of Acceleration and Retardation of Plants, in respect to their Germination and Maturity.*

Acceleration of Plants in their Germination and Maturity, is ranked, by the Lord *Verulam*, among the *Magnalia Naturæ*, and is an operation that all Artists can do something in: though I know not any that arrive to the performance of those grand proposals of some Writers, as that of raising Sallads within an hour or two, whiles a joynt of Mutton is rosting: The late King of *France*, has been reported to have known a secret process that would produce this effect, and to have esteemed it at a high rate: Cichory was the Seed, as I was informed by Monsieur *Gissonius*, which he was wont to raise so soon into his most fam'd Sallad.

I have tryed divers of the Experiments proposed for procuring those wonderful speedy Germinations, and that by long infusions in Milk, strong Muck-water, and sometimes have added unquenched Lime unto the infusions, according to the Experiments set down by a late Writer, who asserts, that by these usuages,

uſages, Beans, Peaſe, and Parſly-ſeed would grow up in few hours, and can only give the Reader this fruit of my pains, that without any further tryal, he may from my experience be aſcertained, that the advantage in acceleration is exceeding inconſiderable by any of theſe means. It was, by my tryal, found much leſs than I imagined could have been by any infuſion, for none of the Seeds (of which I tryed many ſorts) came up the firſt three or four days; and except Radiſh, none came up in a fortnights time, though they were ſown in *Auguſt* and watered.

I have likewiſe tryed the Experiment of Aſhes of Moſs: Firſt, burning a great quantity of Moſs to aſhes, and then taking ſome of the richeſt Garden mould I could procure from a rotten hot Bed, and mixing it with the aſhes, I moiſtned it with exceeding good Muck-water ſeveral times, and let it as often dry in the Sun; this I did in glazed pans, that the Salt might not be waſhed from the Earth; then I ſowed Seeds, ſome unſteeped, ſome ſteeped, and in the beginning of *September* ſet the Pans upon the Leads of an Houſe: But in effect, the Sallad ſprang not up that day, nor many days after.

The next day I ſet into ſome of the ſame kind of Soyle, made up of Moſs-aſhes and Dung, watered as above, divers Seeds ſteeped in Spirit of Urine alone, Spirit of Urine with water mixed, Spirit of Urine mixt with

phlegm of Elder-berries, all without ſucceſs, though I ſet them in a Pan of Earth over a gentle fire, to ſpeed the Germination: Formerly I have ſeen Spirit of Nitre tryed, but to no purpoſe; ſome ſpeak of working theſe ſuddain Germinations by ſomewhat made of Salt, Spirit, and Oyl, chymically united into one Body, which when they ſhall diſcover unto us, or otherwiſe make us poſſeſſors of, we ſhall have a better opinion of the related experiment.

As to ordinary Acceleration, hot Beds are the moſt general and catholick help, and certainly forward Germination much: For Cabbage-ſeed ſown in the Spring on a hot Bed, I have ſeen, to bring Plants that have in their growth and bigneſs overtaken ſuch that were re-planted before the antecedent Winter, and ſo were in the ground, at the leaſt half a year before them; and that in the ſame ſort of Soyl. It is certainly true, that the Germination will be the more quick, the hotter the weather is; and the larger the bed of Dung is made, and the more it is helped by the reflection of Brick-walls, or other like advantages: The manner to make theſe hot Beds, is mentioned in the firſt Chapter, and their uſe there deſcribed.

Mr. *Speed*, *Cap.* 14. *Of Musk-melons*, Gives us from the teſtimony of two Noble Men, this advertiſement: The way, ſays he, to have as good Musk-melons as any are in *Italy*, with-

without the unwholesome use of the Musk-Beds here in *London*, is confirmed by the Earl of *Dorset*. Plant them under a Wall, Pale, or Hedge, on the Sunny side, with very good Mould purposely prepared, and underneath the Mould lay a quantity of fresh Barly-straw, and by this easie means, using the seasonable covertures and necessary furtherance, you may attain to your uttermost desire, without any further trouble. But if you do discern the Straw to make the Earth too hot, thrust in a Stake through the Mould to the Straw, that the vapor and heat may evaporate and pass forth.

I have known some Gardiners about *London* and *Westminster* make considerable advantage by accelerating *Asparagus* upon an hot bed, which they performed thus, These roots having worn out the heart of the Earth where they were set in their Ordinary beds, the Gardiner where he found the Earth most cold, and the root decline and ready to perish, takes up a bed or part of a bed at once, and at what time he thinks good in the Winter, he Plants the same Roots upon a new made hot bed, which doth very speedily shoot out a fair Crop of Asparagus heads, which at that season of the Year they sell at a great rate. And this Experiment may certainly be applyed to any other Sallet, the tops or young leaves of which are eaten, only they all must be expected whiter then such as grow exposed to the

Air and Winds, and the Roots themſelves to periſh by the heat of the hot Bed when the Crop is over.

For Acceleration of maturity in all Wall-fruits, the practice of Midſummer pruning is every where almoſt obſerved, which is, the cutting off all parts of the ſhoots that are grown out far beyond the Fruit, and do otherwiſe take away both the ſap that might advantage the Fruit, and the benefit of the Sun likewiſe: This operation in Vines is called gelding, and is uſually transferred to Pompions, Musk-melons, and Cucumbers, and like Fruits, to accelerate their ripeneſs: The Joynt beyond the laſt Cluſter or Gourd, is the place where the Creepers or Shoots are to be nipt off in Vines or Gourds: In other Wall-fruit the Gardiner clips them at a convenient diſtance from the Wall, ſo as not to take away all the ſhade from the Fruit, which in ſome proportion is neceſſary that the Fruit be not dryed up, and burnt upon the Tree by the Torrid heat of the Mid-ſummer Sun, in ſuch places where his rays are reflected from a Wall or Floor, or both.

'Tis alſo obſerved that in Wall-fruit, or any other that requires a reflected heat, in order to the ripening of the Fruit; the lower the Boughs are ſpread, the ſooner the Fruit ripens on a Wall: And in Standards, the lower and nearer the Earth any Plant is kept, the better ſhall it ripen, By reaſon of the re-

flection

flection made from the surface of the Earth; which if it be bare from Weeds, is equal to the reflection from some Walls. In *France*, Vines have no other reflection but this, being tyed to stakes, and not suffered to grow above a yard high; and in many places of *England* this only advantage, without Walls, brings Grapes to that maturity which is ordinary in our Island.

The making Orchards of dwarf Trees is used upon the same reason; for thereby, here in *England*, your *French* Fruit, as the Boon-Cristien Pear, and the like (which otherwise will not bear in this Kingdom except nailed to a Wall) may be produced. And of this the Royal Garden at S. *James*'s is an Example. The contrivance of these dwarf Trees consists principally in these two particulars. 1. The Graffing the stocks very low, and then secondly by cutting off every year all the new shuits or Cyons, except one inch or two of the greater end, which may be enough to bear one or two buds to sprout for the ensuing Summer; and thus onely keeping the knife from the blossoming Buds, which are easily discern'd by the Gardiner, and may by any one be learnt by the signes above discours'd of, Cap. 8. N. 5. where I have deliver'd the right way of Pruning, and cutting the Cyon; the diligent Gardiner improves his fruit by keeping his Trees as low as he can; commonly not above three quarters of a yard in height.

The twisting of the stalks, whereby the Bunches of Grapes are joyned to the Body of the Vine, done at such time when the Grape is come to its full bigness, is practised by some for the accelerating maturity; and it may be, that by this twisting, the Channels that might otherwise carry more crude Sap into the Grape, being broken, the heat of the Sun may more speedily reduce that which is already possessed by the Grape into sweetness, then if sowre and undigested Juice were still supplyed from the Vine.

Retardation, or hindring Plants from runing to Seed, is likewise of use for the preservation of the Root and Leaf; for there are many Plants, whose last endeavour being to bear Seed, presently die in all parts of them assoon as the Seed is perfected.

Of this kind are your best Carnations and Gilly-flowers, the hope of whose continuation is only by those slips that are not like to bring Seed the present year; to this kind also belong divers Herbs, such as are Parsely, Scurvy-grass, &c. The Spindles therefore of all such are timely to be cut off, the younger the better, in choice Plants, for fear of killing the Root; and hereby plenty of Branches and Off-sets, or side-Plants, will arise from the old Stem, Stool, Root. Nay, 'tis observed by our Gardeners, as likewise by *Ferrarius*, in his Chapter of the culture of Tulips, That if those Flowers are suffered

to

to grow to Seed, the Bulb thereby is certainly much emaciated, and sometimes utterly perisheth; and therefore on all hands it is counted good to gather Tulips as soon as may be.

Some of the ways of Retardation are generally known, as particularly the experiment of plucking of Rose Buds as often as they spring, until the time you intend they shall proceed to flower; or the making the Branches of the Rose-tree bare of Shoots once or twice in the Spring for this purpose, are not unfrequently practised. And I have been informed by a Person of Credit, that at *Bristol* he saw Raspes sold for four pence the quart at *Michaelmas*, which were thus retarded, by setting the Plants late in moist ground the same year: All which ways, I suppose, may well be transferred to other Plants of like nature, and this last way is not so common. I have before mentioned its use for the retardation of the Flowers of Anemonies.

There is some use of Retardation to all such Plants which so prematurely blossom, that they be subject to blasting by Spring-Frosts; I know nothing used to prevent this annoyance, but the opening of the Root, and suffering the Snow, and Snow-water, to lie thereon and chill the ground; but of the benefit or danger of this remedy, I have no experience.

Num. 8. *Of melioration by Richneſs, or other convenient Minera in the Soyl, for the feeding and better nouriſhment of ſeveral Plants: Of Artificial Bogs, and the change of Seed, as a means to bring fair Flowers: Of Exoſſation of Fruit, or making it grow without Stones.*

The Lord *Verulam* reckons up the making of rich compoſts for the Earth, among the *Magnalia Naturæ*, and moſt advantagious projects for the uſe of Man; which richneſs, if the modern Hypotheſis of Chymiſts be right, conſiſts in good proportions of Salt, Spirit, and Oyl; which are principles generally deficient in barren places: Dry Earth, and cold crude water, or theſe two mixt together, every where abounding: I ſay, good proportions, becauſe it is moſt certain, that no Vegetable will grow in too great abundance of Salt or Spirit, or other violently hot and corroſive matter: Sut and Pidgeons-dung abound much with volatile Salt; and I have this year, upon a cold moiſt Clay, ſeen excellent advantage to the Graſs thereby, it being onely ſtrewed thin on the Graſs before the Spring, but of the two, the Sut was beſt: upon a dry Sand I ſhould not have expected the like improvement by its mixture, and in theſe compoſts themſelves by reaſon of abundance of Salt, without due proportions of other principles mixt, nothing will grow, for there

is

is no fermentation without mixture of contrary parts of Elements; and all dunging is in order to fermentation: Hence *Columella* commends Pidgeon-dung, becauſe, ſayes he, *Præ cæteris terram facit fermentare*, the earth generally abounding in its own nature, with coldneſs and moiſture, ſo that the richneſs in Salt or Spirit, tempers a Soyl well, which is deficient in theſe principles, for thoſe Vegetables that require in the ground ſo ſprightfull a fermentation. For divers ſtates of ground, and various Fermentations are required to different Plants, nor can any one Soyle indifferently and equally agree with them all according to that of *Virgil*.

Nec vero terræ ferre omnes omnia poſſunt,
Fluminibus ſalices, craſſiſque paludibus alni
Naſcuntur; ſteriles ſaxoſis montibus orni,
Littora myrtetis lætiſſima: denique apertos
Bacchus amat colles, Aquilonem & frigora taxi.
Aſpice & extremis domitum, cultoribus orbem
Eoaſque domos Arabum, pictoſque Gelonos,
Diviſæ arboribus patriæ: ſola India nigrum
Fert ebenum, ſolis eſt thurea virga ſabæis, &c.

All Grounds can't all things bear: The Alder-tree
Grows in thick Fens; with Sallows Brooks agree.
Aſh craggy Mountains: Shores ſweet Myrtle fills,
And laſtly, Bacchus *loves the Sunny Hills:*
The Yew beſt proſpers in the Northern cold.
The conquered Worlds remoteſt Swains behold!

See

See the Eastern Arabs, *the* Geloni, *these*
Countries are all distinguish'd by their Trees:
The blackest Ebony from India *comes,*
And from Sabæa *Aromatick Gums, &c.*

Gassendus (*Libro de Plantis cap.* 3.) gives us this Information, That Hog dung doth temperate the Acrimony of Onions, and turneth the sourness of Peaches into sweetness. And a little after in the same Chapter, That the Minera of the Earth hath so much influence into the Vertues of the Plants that grow thereon; that the Grass and Herbs are Antidotal that grow, and the very Vipers and Serpents are not poisonous that abide upon the Mountains out of which the Bath waters do Spring.

Boggy Plants require, even when they be planted into Gardens, either a natural or artificial Bog, or to be placed near some water, by which there is great improvement to all sorts of Flags, and particularly, as I have observ'd to *Calamus Aromaticus*.

The artificial Bog is made by digging a hole in any stiff Clay, and filling it with earth taken from a Bog; or in want of such clay ground, there may be stiffe Clay likewise brought in, and laid to line the hole or pit in the bottom or floor, and the sides likewise so thick, that the moisture may not be able to get through: Of this sort, in our Physick Garden here in *Oxford*, we have one artificially

ly made by Mr. *Bobart*, for the preſervation of Boggy Plants, where being ſometimes watered, they thrive for a year or two as well as in their natural places.

But theſe Artificial Bogs are not ſo laſting, but that in two or three years they will begin to decay, For the Clay cracking, and letting the water out, the Boggy Earth being thereby as it were drained, will begin to alter its Nature, and (if I may be pardon'd for the impropriety of the Speech) degenerate into better.

However 'tis true, that there is variety of uſage for Plants of different nature, yet for the generality of Plants, they are beſt improved by a fat, rich, deep, moiſt, and feeding Soil; and it is highly his intereſt that intends a flouriſhing Orchard, or Kitchin-garden, to improve his ground to the height.

And as there is great diverſity of Flowers, ſo there is ſome diverſity of Soyls, though, as I before intimated, for the generallity of the choiceſt Bulbous and Tuberous Roots, a mixture of Cow-dung and Sand well rotted, and incorporated together, maketh a convenient Soyl, to which thoſe that are more curious with good ſucceſs, add towards the top of the Bed (eſpecially where their Seedlings are educated, ſome of that rotten Earth that is uſually found in the bodies of hollow and decayed Willows; This is moſt for Tulips, Anemones, Ranunculus's, Crocus's, and the

the like, and is not unsuitable for the best Flowers that have fibrous or stringy Roots, as *July*-flowers, and Auricula's, though these may endure a greater proportion of dung in the mixture.

Stephen Blake, where he casts off some Experiments as untrue, giveth us a pretty one of his own: I will instance to you, saith he, what I have done, *viz.* I took Camomil, Valerian, Flag-roots, Celandine leaves, these beaten together into a Salve, and applyed to the Roots of Gilly-flowers when they are planted or removed, and watered them with the same. It hath propagated the Flower in bigness, so that it hath made it as big again as any of the ordinary Natural Flowers, and sometimes the colour of them will alter that are thus ordered.

And in his Chapter of the Crocus he hath the like Experiment for the melioration of all flowers from bulbous roots: First, saith he, fill some boxes of the finest mould that may be had, and as dry as may be, then put it into Boxes, then set these boxes in some Garret or Room where they may have Sun and Wind, but no Rain come at them, there let it stand for a twelve Month, then get Sheeps-blood, the juice of Valerian, Camomil, Mallows, and Capons-taile, mix these juices and Sheeps-blood together, then water the dry Earth with this substance, then take your Bulbous Roots, as Crocus, Tulips, Crowns

Impe-

Imperial, Lillies, Snow drops, and the like, Plant them in these Boxes in their several Times and Seasons, and anoint the Roots with this substance at their Planting, Water them continually with the same, let them have no rain, nor any kind of water, but onely this, but Sun, Wind, and Air enough, otherwise these Plants will corrupt, this done, your flowers will spring out of an exceeding large growth, and produce them very early, and I can positively say it will make them differ from what they were formerly.

And in his Chapter of Tulips, for the altering their colour, set, saith he, the Red Tulips by themselves, and the white Tulips by themselves, thus take a quantity of Wild or Garden herbs, and Sheeps dung, and Pidgeons dung, beat these Herbs and the Dung together, when this is done, put some of this into the holes where you set your Tulip Roots, anoint the Roots with the same, and set them into the Holes, and put in more on the top of them, cover them with Earth. This being done, it hath altered the colour upon several tryals, some after one manner, and some after another. But still the red and the white carrieth the greatest sway. So Mr. *Blake*, I lately met with his Book, and take so much notice of his Experiments as to intend a tryal of them, though the second seems more like to destroy, then meliorate it.

That wilde Plants may be meliorated by

transf-

plantation into better Soyl, and by being set at greater distances, is no more then what was before noted, and agrees with that of *Virgil*, *Georg.* 2.

Sponte suâ quæ se tollunt in luminis auras
Infœcunda quidem, sed læta & fortia surgunt
Quippe solo naturæ subest; tamen hæc quoq; si quis
Inserat, aut scrobibus mandet mutata sub actis
Exuerint Sylvestrem animum, cultuq; frequenti,
In quascunque voces artes, haud tarda sequentur.
Nec non & sterilis quæ stirpibus exit ab imis
Hoc faciet vacuos si sit digesta per agros.
Nunc altæ frondes & Rami Matris opacant:
Crescentique adimunt fœtus, uruntque ferentem.

Plants that advance themselves t'etherial Air
Unfruitful be, but strong they prove, and fair;
Because they draw their nature from the Soyl:
But these, if any graft, or shall with toyl
Transplant, and then in cultur'd Furrows set
Their wilder dispositions they forget:
By frequent culture, they not slowly will
Answer thy labour, and obey thy skill.
So they that spring from Roots, like profit yeild,
If you transplant them to the open Field,
Which now the Boughs of th'Mother-plant do shade
And th'Off-sets stop her growth, & make her fade.

The Seed of wild Cichory that grows every where in the Fields, being sow'd in rich Garden-soyl, is so improved, that we esteem it ordinarily another Plant, and give it the name of

of Garden-Cichory, though indeed they are the ſame. But beſides the goodneſs of the ground, and greatneſs of the diſtances, there may be ſome advantage to Field-plants, by changing the Seed, by which action the fermentation is ſuppoſed to be augmented in the Ground: Now theſe changes are either from one kind to another, as from Wheat and Barly, to Beans and Peaſe, which is the uſual Husbandry of common Fields, or in the ſame Seed: Of the former way, *Virgil* gives this Precept.

——Ibi flava ſeres mutato ſidere farra
Unde prius lætum ſiliqua quaſſante legumen,
Aut tenues fætus Viciæ, triſtiſque Lupini
Suſtuleris fragiles calamos, ſylvamque ſonantem.

Georg. 1. By Mr. *Ogilby* thus rendred.

——There changing Seaſons thou ſhalt Barly ſow,
Where pleaſant Pulſe with dangling Cods did grow,
Where brittle ſtalks of bitter Lupines ſtood,
Or ſlender Vetches in a murmuring Wood.

Of changing the Seed of the ſame kind, beſides Field Corn, which is generally changed every third Seaſon at the fartheſt, examples may be had in Carnations and Gilly-flowers, the Seed of which, being taken from the beſt Flowers, are much meliorated by alternation and change of Ground; and it is like this Experiment may hold in the ſeeds of other Flowers.

Ano-

Another Experiment, is the exoſſation of Fruit, or cauſing it to grow without ſtones or core, for which effect, the grafting of the upper end of the Cyon downwards, hath been aſſerted to be a certain way: That the Cyon ſo grafted will grow, I have experience; but whether in time they will produce the forementioned effect, I greatly doubt: And if they ſhould, I much miſtruſt their expectations would not be anſwered, that intend melioration thereby: For the Fruit, certainly by the loſs of the natural Seed, would be very much diſpirited, and looſe the generoſity and nobleneſs of its nature, as Animals do, and as Vegetables ſometimes; as particularly I have obſerved in Barberries, for I have ſeen a Tree that bare every year on moſt Bunches two ſorts of Barberries, the one full, and of a deep Red; the other of a pale colour, and thin ſubſtance, and inquiring into the caſe, I found the former to have Stones in them, and the latter deſtitute, which were, as I ſuppoſed, thereby emaſculated.

Num. 9. *The concluſion of the Treatiſe, with one or two choice obſervations of the wiſe and good Providence of God, which may be ſeen in the admirable mark of Vegetables, and fitneſs to their ends, which are not generally taken notice of, but are, with many more, overſeen by men buſie in the affairs of the world.*

It

It was the Sin of the Heathen that they did not rise in the exercise of their minds from the contemplation of the beauty of the Creatures, to consider how such Lineaments could be made, and to glorifie thereby the Wisdom of the Maker. The particulars are infinite, that ordinarily to a man exercised in things and thoughts, suggest themselves to avouch the existence of a Providence, and to confute the vanity of the old Epicureans in the simplest of their Tenets concerning the framing of this world, of things by a casual concurrence of small Atomes or Motes intricated in their motion, by meer chance into such beautiful bodies.

It is no unusual Theme to treat of the admirable handsomness and beauty in the composure of divers Vegetables, and to shew how Nature doth κοσμοτρεῖν in them, and characterize out such variety of elegant figures, that every Plant shall seem to have more of Mathematical art, than the Knot wherein it is set; And 'tis generally noted, that Gods Providence is exceeding good in appointing Nature, and making it her end to continue some individuals of every Species for the preservation of the kind. That likewise the same Providence has approved to its self a most excellent Wisdom in the choice of most certain means, for the attainment of this end, it has been mine, and may be an easie consideration to any other.

For what other end, thought I, are there so many coats, and such cotten vestment to seeds, but to defend their tenderness? Why such hard stones to others, but to hinder their premature springing, whereby the coldness of winter would kill (as in Aprecots, Peaches, Nectarines, &c.) their tender seedlings? Why is the ground in Woods covered with Moss, but that Nature intended it as a preservation to Seeds fallen upon the Turf in the violence of Winter Frosts? Why has Nature beset shrubs with prickles, but to defend the tender buds in which the hope of future growth is reposed from the browsing of Cattle in the Winter? and that this was the end of Providence in it, may be conjectured from hence, because those shrubs which are not all over thorny, have a guard of Thorns directly upon the bud, and not elsewhere, as if singularly intended for its security. So 'tis seen in the Goose-berry, Hawthorn, Barbery, Locust, all Roses wild and cultivated, that are not all over thorny, so that the thorns are not useless excrescencies as some have supposed, but as profitable as boughs or leaves.

Why have those Plants that bear no Seed with us, as Poplar and Willow, in every bough of any bigness, a propensity of sending forth Roots, by the occasion of which, each branch is made an entire Tree or Plant? or if that faculty be wanting, why then is there so great disposition and forwardness to propagate them-

themſelves by off-ſets, as in the Elm, Poplars, &c. And where there can be no off-ſets, as in Muſhrooms, wherefore elſe has Nature made the Plants propagable by the ſmalleſt of their ſhreds and inconſiderable parts? Why elſe is the Indian Fig, that hath no ſtalk, propagable by its leaf alone?

Why have Plants ſuch an eagerneſs to flower and ſeed, and ſuch an impatience of being diſappointed? if you pull off the bud of the Roſe it will ſpring again, and not onely the Roſe, but moſt other fruits and flowers have the ſame deſire to produce their ſeeds, and have given occaſion to Artiſts to make hence Rules of Retardation.

Why do the Seeds ſtick cloſe to the Pedal, by which they are joyned to the ſtock until they are mature and fit for propagation, and then fall off in the moſt fit ſeaſon for due preparation to future growth?

Why do thoſe Plants that uſually die every year, yet if they are diſappointed of running to ſeed, continue to ſurvive many years, even ſo long till they are permitted to run up to leave ſeed behind them? But that they are appointed by the univerſal Law of Nature, not to deſert their order, till they have produced others after their own kind.

Laſtly, why are many Seeds at their firſt ripening ſo exactly fledged with wings, but that by the wind, they may be carried to ſuch places as may be fit wombs to receive and feed them,

them, until they attain from the being of seeds, the measure and stature of perfect plants.

Another Specimen of the Wisdom of the God of Nature, may be seen in the regular situation of Branches, and the orderly eruption of Buds, upon every Vegetable; for, notwithstanding the report of my Lord *Bacon*, *Nat. Hist. Cent. 6. Observ.* 588. *That Trees and Herbs in the growing forth of their Boughs and Branches, are not figured, and keep no order, but that when they make an eruption, they break forth casually, where they find best way in their Bark and Rind:* I find my self necessitated to refer that to an exceeding Wisdom, which his Lordship refers to chance and casualty: For if I observe aright both Buds, and Leaves, and all eruptions, stand so on every Vegetable, as to serve most fitly for most necessary ends.

As to Leaves, the Learned Doctor *Brown* hath made the Quincunx famous, which may with as great aptness be applyed, and, I think more universally to the scituation of Buds, or Germens.

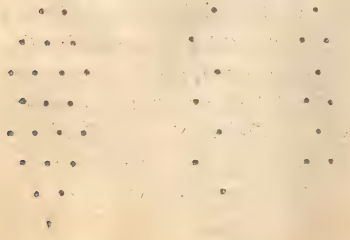
This Figure had its name from the numeral Letter V. because the points therein, are the same with the points or Angles in the said Letter, and because that as the Letter is capable of infinite Multiplications, so is the Figure, and both in not unlike fashions: The number thus, V. X. XX. XXX. the Figure

thus,

thus,

Of this Quincunx I ſhall propoſe three ſorts. 1. The thicker, as in the Figure *a*. The thinner and leſs full of points, are either obliquely ſet, as in the Figure *b*. or more ſtrait, as in the Figure *c*.

a *b* *c*



The moſt thick ſort of Quincunx hath its examples rather in Leaves then Buds, for after this manner ſtand the Leaves upon moſt Martagons and Lillies, divers Spurges, and Sedums, on which it is moſt viſible, when the Plants run up to Seed. Trickmadam, Spurge-Laurel, Marſh-mallows, when the ſtock is exceeding ranck and big, for otherwiſe it is ſufficed with the regulations of the third Figure: The leaves of Fir-tree, Pine-tree, *&c.*

The ſecond, or oblique, and ſingle Quincunx, may for the moſt part be obſerved, both

in the Buds and Leaves that ariſe from Trees, and ſuch other Plants whoſe ſtalks are round; as in the Oak, Elm, Haſel, Apples, Plums, Cherries, Pears, Willows, Sallows, Oſiers, Black-thorn, White-thorn, Gooſe-berries, Currants, Roſes, Fennel, Cichory, Thiſtles of moſt ſorts, Docks, Bur-docks, Sothern-wood, Rue, Seſeli-Æthiopicum, Sweet-maudlin, Common-mercury, Dulcamara.

I find indeed the Learned *Gaſſendus* to have put Apples among thoſe Plants whoſe leaves ariſe from the ſtalk without order. *Prodeunt folia in quibuſdam ſine ordine ut in Malis, in quibuſdam Ordinate ut in Roſâ.* But every mans Eye that marketh the ſituation of the Buds upon any freſh ſhoot of an Apple that ſuſtains Buds enough to admit the Quincunx, will be ſatisfied that I have not erred in my Obſervation: Nor do I account it an Error that I affirm the Buds of Roſes and Apples to obſerve the ſame manner of the Quincunx. The cauſe why *Gaſſendus* Obſervation differs from mine is: Firſt, that He obſerved not the Figure of the Eruption of the Buds in Apples, nor in Truth in Roſes. Secondly, his Notion of a leaf and mine is different, I take thoſe parts for ſeveral diviſions of the ſame leaf which He accounts for diſtinct leaves: For whatſoever ſtands upon that ſtalk which covers the Bud, is in my account part of the ſame leaf, becauſe theſe parts all meet together in one Stalk, fall together in the Winter, and the edges of the

ſtalk

ſtalk ſeem dilated at the end where it joynes to the ſtemme of the Tree, as if purpoſely figured for the ſafety of the Germen or Bud: And the like diviſions of Leaves may be ſeen in divers other Plants: as in Tanſy, Celandine, Argentine, Agrimony, Valerian, and in divers leaves of Trees, as in the Aſh-tree, Wallnut, and very many others. And if any one would obſerve the order of leaves, what I have ſet down here of Buds, will give him light in his Enquiry. For though not always, yet it moſt commonly holds, that the leaves and Buds ſtand in the ſame order; One great end of the ſtalk of the leaf, and leaf it ſelf, being to defend the tender Bud from the Violence of the Summer heat.

The third direct, and oblong Quincunx, is moſt obſerved in Plants of a ſquare ſtalk, as Water-betony, Fig-wort, Lavander, Mints, St. Johns-wort, Clowns-all-heal, Rhus-Myrtifolium, Mother-wort, Nep, Colus-Jovis.

Yet 'tis not unfrequently ſeen on other Stalks alſo, as the Sycamore, Elder, Maple, Dog-tree, Aſh, Hyſope, Nettles, Hemp, Willow-weeds, Tree-Spurge, French-Mercury, Scammony of Montpelier.

And it is to be obſerved, that in divers of thoſe Plants whoſe Stalks are ſet with Joynts, and thoſe Joynts with a beautiful Circle of Leaves, proper to each Plant, contrary to the Quincuncial Situation, the Germens, notwithſtanding, are found to follow the order

of this last mentioned Quincunx, as may be seen in Madder, Goose-grass, Ladies-Bed-straw.

Or if that order be left, yet it is not left to the disadvantage of the Plant, but generally it hath in exchange some other handsome and proper method of Leaves and Buds. Thus *Linaria-Quadrifolia*, hath on each joynt three, four, five or six opposite Leaves, and under each leaf a Germen, which arise to Branches, uniformly set upon the same round Stalk.

And as to the particular make and frame of those Plants, which in the standing of their Leaves cannot be said to follow the order of any Quincunx, yet they, instead of those elegant Tessalations, are beautified otherwise in their sight with as great curiosity. I cannot think of a Plant, according to the ordinary estimation of men, that is more contemptible then that which grows ordinarily in Bogs, or miry Ditches, and is called Great-Horse-tail; yet if any man please to disartuate the whole, and take particular view both of the parts and conjuncture, they will find the frame exquisite enough to deserve a better esteem; for both stalks and leaves are made up of divers pieces, framed, as it were, in joynt work; all which pieces bear exact proportion each to other; and each receives other bindented terminations, which form very beautiful Coronets on the peices so received; then at a convenient distance, above each of these Coronets,

ronets, there ariseth a very beautiful Circle of Leaves, and these very leaves are made up of hollow peices articulately, and proportionably joynted, in imitation of the elegancy of the joynts of the stalk it self.

And generally the Leaves that stand not according to the Quincunx, either stand in joynts, in the fashion of the Burgonian Cross, as on Cross-wort; or in a Circle, as on most sorts of Madder, Ladies-bed-straws, Woodroofs; or in some other profitable, fit and beautiful positure: And though in these creeping and entangled Plants, irregularities are not unfrequently seen, yet even in these irregularities themselves, there often seems to be a greater curiousness, and most proper order; as particularly, Madder is generally tetragonal, and notwithstanding its circular border of Leaves, usually sends forth Buds, according to the manner of Mints, and other Plants of a four-square Stalk: This I have sometimes seen in many of its Branches to vary and turn hexagonal, or to have a stalk with six ribs, upon which declension the order of the Germens was thus most fitly altered; upon each rib or angle there was always one leaf, and upon every other rib, a Germen under the leaf; which I found so placed, that no one rib did bear the Bud in the two succeeding joynts; so that if in the first joynt, the three Buds stood on the first, the third, and the fifth ribs, then in the second joynt,

the

the Buds stood on the second, the fourth, and the sixth, and so interchangably to the very top.

Now by these Situations of the Buds, according to these Observations, it always is so found necessarily to be, that if two buds stand on the same joynt, as in the third Quincunx; those that stand on the same heighth, keep always the contrary sides; and further, if the two lowermost stand North and South, the two next immediately above them stand East and West. And in the second, or oblique and single Quincunx, when the buds stand not two at the same heighth, the second stands on the opposite side to the first, and the fourth to the third; and then likewise, if the first and second stand East and West, the two next above them stand North and South.

I may give notice, that to find these methods, and to expose them to the eye, a profitable way may be to clip off the stalks of the leaves near the branch, especially in the first and most thick sort of Quincunx; in the second more single Quincunx, it may not be amiss to slit the bark and take it off, for it being laid plain and flat, the Quincuncial order will the better appear; the third sort is visible to the eye, as the Plant grows.

Care also must be had, that observation be made on such Plants whose stalks are not twisted, for the twisting of it brings the Leaves and Germens out of order: There may besides

sides these, some other methods appear not here mentioned, but even in them, he that pleases to consider them, I doubt not, will find constancy for the most part to their rule; or if they have no rule, there may likewise a reason be found why it was good they should be without.

I might also instance in other Excellencies, which some observe in the formation of Plants, as particularly that of the tendrels of Vines, Gourds, Kidny-beans, and other sorts of Pease, and of Plants of the like Nature; which are so pretty, and so dextrously used to the upholding those sorts of Vegetables, that the Wit and Art of Man could not have devised any thing more fit for the use, or neat for the contrivance.

But it is most certain, that these are the general methods, and these contrivances of the eruption of Buds, serve for divers excellent ends exceeding fitly, and so are arguments, (how poor and inconsiderable soever these Observations may seem) that they came not out by the lucky justlings and stumbling of blind chance, but by the Providence of a most Powerful, Skilful, and Wise Artist and Author. For they serve first to procure a fit and proportionable shade for the Stalk and Fruit; neither of which in their tenderness, can endure the scorching Sun-beams, for by keeping this method and order, they communicate their shade to all parts of the Tree

or

or Plant; whereas, should they break out in a disorderly fashion, some parts of the Plant, and some Fruit, would be exposed to all weather, where no Buds or Leaves come forth; other parts would be too much shadowed by the too thick eruption of Buds. This order likewise sets out the boughs and branches of each Tree into such positions, that one may not easily fret upon another, or gall its neighbour, but grow in a distinct room, every branch having his proportionable allowance in that circumferenee which the whole Tree takes up, whereby it may, without any impediment to others, grow to a convenient bigness; otherwise came many Buds out together without method, they could never arrive at any bigness in their future growth, nor attain to good Fruit, or pleasant Leaves and Flowers, but would run out into such thick Crows-Nests, as I have observed sometimes to happen in Plum-trees by an Error or mischance of Nature, in the parturition or bringing forth of the Germens. The observation likewise of these methods, must needs be of use to the Equilibration and uprightness of Trees, for should all the boughs break out in one place, or on one side, the heaviness of that side or part, would bend down the body into a crookedness, and deprive it of that uprightness and straitness, which is the most useful site of most Plants; and those that are without these regulations, are generally such

as

as are made to grow upon, and twiſt about other things, and not to bear up themſelves, as Bind-weeds, and the like.

And now I am come thus far, there comes into my mind that excellent Animadverſion which the moſt wiſe King made, when he had conſidered the ſeveral Purpoſes, Travels, Buſineſſes, Changes, and Overtures, which happen to us poor men while we are under Heaven, in their ſeveral Seaſons; as particularly, in the days of our Birth, and the days of our Death, in the days of our Planting, or being Planted, and thoſe of our Plucking, or being Plucked up: When Men get and Increaſe their Eſtates, and when they Looſe, grow Bankrupt, and are undone; in the dayes of their Jollities, Dancings, Lovings, Wooings, and Embracings; as likewiſe in thoſe cloudy and dull Seaſons, when ſatiety of Enjoyment, indiſpoſition of Body, or other unhappy accidents, has begot Peviſhneſs and Loathing; and when Tears and Mourning contriſtate all their glory and beauty: Concerning the ſeaſonableneſs and fitneſs of all the Eſtates of men, their condition, accidents and diſaſters in their ſeveral times, This is his obſervation, *Eccl.* 3. *That he had ſeen the travel which God had given the Sons of men to be exerciſed therewith*, and found, that God by his Providence had made every one of the things made, *beautiful in its time*: *Moreover, that he had ſet the age in the middle of them*, yet ſo, that *no man of them*

can

can find out the work that God maketh from the beginning to the end.

I shall not Apologize for Translating העלם the age or בלבם in the middle of them, because I know the words, and methinks the sense and context bear it best, but shall beg leave by a parallelism to apply it to the present matter; the placing, not the timing of things, and to express my thoughts thus: That God has made every thing beautiful in its place, order and situation, and particularly every part of every Vegetable, and has also set the world so curiously wrought and modell'd, in the middle of us, yet so, that by reason of our various affairs and businesses, and other fancies, no man can find out the work that God hath made from the beginning to the end.

Lastly, I must beg leave to make the same conclusion and Appendix to the Observation, that the King has there appos'd to his, (*viz.*) That the true and only use that can be made of those Elegancies and Beauties, which in every aspect suggest themselves unto us, is no other, but that we *Rejoyce in them*, and in their Maker, *and do good in this life*. I mean, that we puzzle not our selves over-much, nor discruciate our Spirits to resolve what are the causes, and what the manner of causation of the apparent effects of Gods great Power, any further then as our labour may serve for those excellent and firmly together interwo-

ven

ven ends *of rejoycing and doing good*, and the rather, becauſe of the experiment which this moſt wiſe Prince, who was helpt by the great Riches of his then puiſſant Kingdome, (and ſo not impeded by thoſe wants that uſually diſcomfit private perſons in ſuch enquiries) made himſelf and publiſhed concerning his own ſearch, *Eccl.* 1. *That he gave his heart to ſeek and ſearch out by Wiſdom concerning all things that are done under Heaven, and found this to be a ſore Travel, that God had given the Sons of men to be exerciſed therewith.* And further, That *with much Wiſdom, there is much Vexation, and he that increaſeth Knowledge, increaſeth Sorrow.*

FINIS.

A CATALOGUE *of some Books Printed for, and to be sold by* Richard Davis *in Oxford.*

IN FOLIO.

DR. *Hamond's* Paraphrase and Annotations on the New Testament, the third Edition, 1671.
——On the Psalms. ——His Sermons.
A Poem to the Duke of *York* on our late Sea fight with the *Dutch*, by J. M. C. C. *Oxon.*
Dr. *Pearson* on the Creed; the third Edition, 1669.
An Elegy on the Death of the Duke of *Glocester*, by *Mr. Lluellyn* Dr. in Physick.
Lucian's Dialogues, made English from the Original, by *Jasp. Mayn*, D. D.
Mercator's Atlas, Englished by *W. Saltonstall.*
Four New Playes. The Seige of Urbine. Selindra. Love and Friendship. Pandora. By Sir *Will. Killigrew*, Vice-Chamberlaine to Her Majesty, 1666.

In QUARTO.

DR. *Hamond's* Practical Tracts, 2. Vol.
——A Collection of several Replies and Vindications of the Church of *England*, in 4. Vol.
The hurt of Sedition, or the true Subject to the Rebel, by Sir *John Cheek*, with a Preface of D. *Langbaines.*
The Christian Race, a Sermon on *Heb.* 12. 1. by *Tho. Barton*, D. D.
A Funeral Sermon on *Phil.* 1. 23. by *John Millet.*
The Vaulting Master, or the Art of Vaulting, illustrated with sixteen brass Figures, by *W. Stoaks.*

Christ and his Church, or Christianity explained in 7 Evangelical and Ecclesiastical heads, by *Edw. Hyde*, Dr. in Divinity, sometime Fellow of Trinity College in *Cambridge*, and late Rector of *Brightwell* in *Berks*.

Cheerful Ayres or Ballads, for three Voices, by *J. Wilson* Dr. in Musick, late Professor of the same in the University of *Oxford*, and one of the Gentlemen of his Majesties Chappel, in 3. Vol.

Threnodia, on the Death of the high born Prince, *Henry* Duke of *Glocester*, by *Arth. Bret* of Ch. Ch.

Hosanna, a Thanksgiving Sermon on the Kings Return, on *Psal.* 118. v. 22,23,24,25. by *Jo. Martin*.

A Sheet of Directions for daily Examination of Sin, by Bishop *Usher*.

The Throne of *David*, or an Exposition on the second Book of *Samuel*, by *W. Guild*.

Coll. *Henry Martin*'s Familiar Letters to his Lady of delight; Also her kind Returns, &c. Published from the original Papers, by *Edm. Gayton*.

Howels Vocal Forrest, the First part.

Davenant, *Morton*, *Drury*, &c. Good Counsels for Peace.

Sicily and *Naples*, or the Fatal Union. A Play.

Imperiale, A Play.

Some considerations, touching the Usefulness of Experimental Natural Philosophy, propos'd in Familiar Discourses to a Friend, by way of Invitation, to the study of it, by the Honourable *Robert Boyle* Esquire, The 2*d* Edition.

Philosophical Transactions of the Royal Society. Numb. 6, 7, 8. 1666.

The Miraculous Conformist, or an Account of several Miraculous Cures performed by the stroaking of the Hands of Mr. *Valentine Greatrecks*; with a Physical discourse thereupon, in a Letter to the Honourable *Rob. Boyle* Esq; by *Henry Stubbs*, Physitian at *Stratford* upon *Avon*, 1666.

Nehemiah, or the Excellent Government: A Sermon Preached at *Dublin*, *Aug.* 69. before the Right Hon. *Thomas*, Earl of *Ossory*, then Lord Deputy of *Ireland*, by *Jo. Parry*, D. D. and Dean of the Holy Trinity in *Dublin*, 1670.

Mr.

Mr. *Boyle*'s 2 Vol. of his Experiments of Air, with many Figures engraved on 8 Brass Plates. *Also* his Treatise of the Atmospheres of consistent Bodies. *1669.*

A Sermon Preached at a Visitation at *Grantham* in the County and Dioceſs of *Lincoln*, 8 *Octob.* 1641. on *Mat.* 15. 9. by the Right Reverend Father in God, *Robert Sanderſon*, late Lord Bishop of that Dioceſs, in Folio and Quarto. 1671.

Two Patterns of Goodneſs and Charity; one of *Job* in the midst of his Honour and Wealth, the other of the Widow of *Sarepta* in the Extremity of her Poverty, in two Sermons by *David Stokes*, D. D.

A Censure upon certain Passages contained in the History of the Royal Society, as being destructive to the Established Religion and Church of *England*, by *H. Stubbs*, Physitian in *Warwick*, the second Edition with additions, 1671.

His Replys to *Glanvil*, *More*, &c. 1671.

Dr. *Peirce*'s Sermons. 1671.

A Correct Copy of some Notes concerning Gods Decrees, by *T. Peirce*, D. D. 1671.

Mr. *Boyle*'s Considerations of the Usefulneſs of Experimental Philoſophy, the 2*d* Vol. 1671.

A Sermon Preached in Lent Assizes at *Alesbury*, *Mar.* 8. 1671. being *Ash-wedneſday*, by *Ad. Littleton*, D. D. Chaplain in Ordinary to His Majeſty.

Joan. Buridani *Quæſtiones in octo Libros Politicorum Ariſtotelis.*

Porta Moſis, ſive Diſſertationes aliquot R. Moſis Maimonidis, nunc primum Arabice, prout ab ipſo Authore conſcriptæ ſunt, & Latine editæ, una cum Appendice Notarum Miſcelan. Opera & ſtudio E. Pocockii *Ling. Hebr. & Arab. in Acad. Oxon. Profeſſoris.*

Hiſtoria Dynaſtiarum Arabice. Authore Gregorio Abulpharagio *Edit. Interpret. & Continuat. per* Ed. Pocock, *L. Hebr. & Arab. Profeſ.*

Britannia Rediviva Muſarum Acad. Oxon.

Epicedia Acad. Oxon. in Obitum Hen. *Ducis Gloceſtrenſis.*

Idea Trigonometriæ Demonſtratæ. Item de Cometis, & Inquiſitio in Bullialdi Aſtronomiæ Philolaicæ Fundamenta,

Authore Setho Ward, *nunc Episc. Sarisb.*

Savilii Oratio Coram Eliz. *Regia.*

Academiæ Oxonienſis Notitia. 1665.

Diſſertationes quatuor Quibus Epiſcopatus jura, &c. Contra ſententiam D. Blondell *& Aliorum, Auth.* H. Hammond, *S. Theolog. D.*

Tabulæ Longit. ac Latitud. Stellarum Fixarum, ex Obſervatione Ulugh Beighi *Tamerlanis Magni Nepotis, ex MSS Perſicis, jam primum Luce ac Latio donavit, & Commentariis Illuſtravit* Tho. Hyde, A. M. *Coll. Regina, ac Protobibliothec. Bodleian. apud Oxon.* 1666.

Oxonium. Poema, per J. V. Ex Ædæ Chriſti.

In OCTAVO.

DR. *Hamonds* Practical Catechiſm, with the Reaſonableneſs of Chriſtian Religion.

A View of the Threats and puniſhments recorded in Scriptures, Alphabetically compoſed, with ſome brief Obſervations upon ſeveral Texts, by *Zachary Bogan* of C. C. C. in *Oxon.*

——The Mirth of a Chriſtian life, and the ſorrows of a wicked Life, by the ſame Author.

Fides Apoſtolica, or, A Diſcourſe aſſerting the received Authors and Authority of the Apoſtles Creed: Together with the grounds and ends of Compoſing thereof by the Apoſtles, the ſufficiency thereof for the Rule of Faith, *&c.* by *George Aſhwell.*

——*Geſtus Euchariſticus*, a Diſcourſe concerning the Geſture at the receiving of the Lords Supper.

A Treatiſe of the Preſervation of the Eye ſight, by Dr. *Baily.*

The Circles of Proportion, and the Horizontal Inſtrument, *&c.* Both invented, and their uſe written, by *W. Oughtred* Ætonenſis.

The Natural Mans blindneſs, in 3 Sermons on *Rom.* 7. 7. by *H. Hurſt.*

Eſſays and Obſervations on the Humors of the Age, Diſcovered and Characterized, by *W. Maſters*, A. M. Fellow of *Merton* College.

Ovid.

Ovids Invective against *Ibis*, translated into English Verse, by *Jo. Jones* Schoolmaster in *Hereford*, 2*d* Ed.

A plain and profitable Catechism, with a Sermon on *Exod.* 23. 2. by Mr. *James Bacon*, published by Dr. *Hen. Wilkinson.*

A Divine Theater, or a Stage for Christians, a Sermon at Ch. Ch. in *Oxford*, by *John Wall*, D. D.

Cluverius Geography in English.

Shepheard of Sincerity and Hypocrisie, with a Tract annexed, to prove that true Grace doth not lie so much in the Degree, as in the Nature of it.

Ellis's Divine Poems.

Downham, of Christian Liberty.

Homer a la Mode, a Mock Poem upon the first and second Books of *Homer*'s *Iliads*, 2*d* Edition.

Christian Liberty Rightly stated and Enlarged, in a brief Vindication of the Lawfulness of Eating things strangled, or Meats confected with Blood, by *W. Roe.*

The Nullity of the Romish Faith, or a Blow at the Root of the Romish Church, being an Examination of their Fundamental Doctrine concerning the Churches Infallibility, by *Mathew Pool*, late Minister of the Gospel in *London*, 1671. the 4th Edition.

The Origine of Forms and Qualities (according to the Corpuscular Philosophy) Illustrated by Considerations and Experiments, by the Honor. *Robert Boyle* Esq; Fellow of the Royal Society, 1667. the 2d Edition.

Hydrostatical Paradoxes, made out by new Experiments, (for the most part Physical and Easie) by the same Honorable Author, 1666.

Whitby's Answer to Sure-footing, and Fiat Lux. 1666.

Holland of taking the height of a Comet.

The City Match, and Amorous War, 2 Plays by *J. M.* of Ch. Ch. *Oxon.*

The Devil of *Mascon*, or a true Relation, of the chief things an unclean Spirit did, and said at *Mascon* in *Burgundy*, in the house of Mr. *Fra. Pereaud*, Minister of the Reformed Church there. Published in *French* by the said Minister, and made *English* by one that hath a particular knowledge of the Truth of this Story; the fourth Edition.

An

An Impartial Censure of the Platonick Philosophy, to which is adjoyn'd, An Account of the Nature and Extent of Divine Dominion and Goodness, as they refer to the Origenian Hypothesis, concerning the Præexistence of Souls, &c. by *Sam. Parker.*

Tracts written by the Honourable *Robert Boyle*,

About { The Cosmical Qualities of things. / Cosmical Suspicions. / The Temperature of the Subterraneal Regions. / The Temperature of the Submarine Regions. / The Bottom of the Sea.

To which is Prefixt, An Introduction to the History of particular Qualities. 8o.

De Confirmatione, sive Benedictione, post Baptismum solenni, &c. *Authore* H. Hammond.

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